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The Place of Exporting in Planned Prosperity

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IN HIS public announcement, dated Nov. 5, 1929, calling the business leaders of the United States into conference, President Hoover said:

"The next practical step is the organizing and co-ordinating of a forward movement of business through the revival of construction activities, *the stimulation of exports*, and of other legitimate business expansion, especially to take such action in concert with the use of our new powers to assist agriculture. Fortunately, the sound sense, the capacity, and readiness for co-operation of our business leaders and Governmental agencies give assurance of action."

Consideration of the words in italics prompts the following studies of the export situation as applied to metal-working machinery. In the first place, how much of it is there? Present indications are that the total volume of such business for 1929 approximated $40,000,000, as compared with $34,000,000 in 1928, $25,000,000 in 1927, and $13,000,000 in 1923—figures that suggest substantial and satisfactory growth. Yet those familiar with the trade feel a certain dissatisfaction because American machinery in foreign countries often "sells itself." It is not sold in the sense that it is supported by adequate constructive salesmanship. In making this statement, it is of course realized that some manufacturers are adequately represented abroad, but all too frequently this important trade is in weak hands, and is handled more or less indifferently. There is a great deal of merit in President Hoover's suggestion, as applied to the metal-working machinery industry, that greater prosperity can be attained through more adequate attention to export markets by American manufacturers generally.

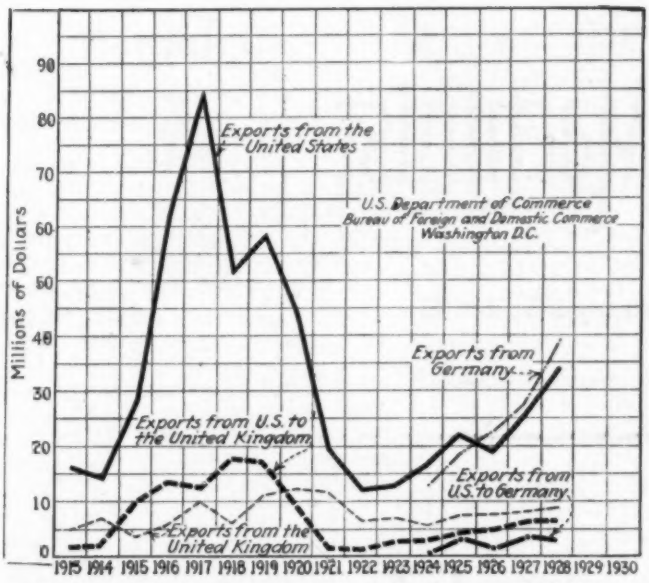
In part, this increased volume of business would result from the creation of new business, and in part, it could probably be developed by displacing competitors who appear to secure a larger share of the existing volume of business than the merits of the situation justify.

Of the existing business, 60 per cent goes to Europe, 20 per cent to Canada and Newfoundland, 8.7 per cent to Latin America, 7 per cent to Asia, 2 per cent to Australia and New Zealand, and 1 per cent to Africa. These figures are most interesting because our principal competitors are to be found in Germany and Great Britain. The ability of the American manufacturer of such machinery in export is clearly indicated by the large volume of such equipment that is shipped to Europe.

From the world point of view, the comparative positions of the leading countries in this trade in 1927 were as follows:

Germany	$31,619,000
United States	25,379,000
Great Britain	7,712,000

These figures will have a different meaning for each individual manufacturer, because those who make highly specialized production tools, or the newly patented tools that escape foreign competition, have a marketing problem very different from that of the makers of high-quality but standardized tools copied by foreign manufacturers. And these latter, in turn, have a different kind of a



Total exports of metal-working machinery from the United States, United Kingdom, and Germany, as compared with exports from the United States to the United Kingdom and Germany

marketing problem than have the builders of ordinary standard types of machine tools produced for decades in several countries. Manufacturers of the first type will undoubtedly find their best opportunities in the manufacturing countries of Europe. Manufacturers of the latter type will find their best opportunities in the Far East and in Latin America, although it should not be assumed that even these tools cannot be sold in Europe. It is truly amazing to observe the results of the application of good salesmanship.

The general trends of this trade are shown in the accompanying chart, which indicates quite clearly the strong upward trend which has prevailed in this business since 1922, and also the fact that the trend represents greater volume than has ever been known, except during the boom from 1915 to 1920. This diagram also serves to emphasize the manner in which this trade has recovered from the complications introduced by the war and by the huge volume of metal-working machinery left in warehouses and as second-hand equipment at the end of that experience.

In his remarks before the Business Men's Conference in Washington on December 5, President Farrell, of the Steel Corporation, pointed out that the manufacturing equipment of the steel industry becomes obsolete at the end of sixteen years. Applying this same rule in Europe, it is obvious that a huge volume of metal-working equipment is on the verge of total obsolescence in those markets. Consequent sales potentialities are of the greatest importance.

The trends in Latin America and Asia are radically different. The figures in Table I show quite clearly how, in Latin America, a small pre-war business expanded tremendously under the influence of wartime and post-armistice boom conditions. It subsided somewhat in 1922, 1923, and 1924, since which time it has maintained a fairly uniform volume of about two and three-quarter million dollars, a level that represents substantial growth, as compared with pre-war conditions, and also suggests that this group of markets is capable of far greater development. The figures applying to Asia are somewhat similar, except that during the boom years the expansion was far more extreme. It will also be remembered that, during more recent years, business conditions in China, India, and Japan have not been so satisfactory. Nevertheless, the potentialities of these markets are so great as to encourage the belief that these areas deserve very careful attention as soon as political and business stability is attained.

It is exceedingly difficult to show by mere statistics the full significance of this trade in metal-working machinery, because in presenting statistics we are in great danger of trying to add such dissimilar things as dogs and cats, for in these figures we group together information concerning the export of intricate precision machinery that is valued perhaps as high as $2 a pound, and in the same tabulation, information regarding rather heavy, rough-and-ready equipment that may be worth less than 30 cents a pound. These divergencies become particularly significant when comparing export returns from different countries, because the expression "machine tools," as translated from language to language, has a different implication, with the result that the classifications of no two countries are exactly comparable. And, then, for example, it may be taken as a general rule that American exports of metal-working machinery command twice the price per pound that is asked for German equipment. British exports similarly command very low prices.

With such reservations in mind, it is exceedingly interesting to compare the distribution of the exports of metal-working machinery from these various countries, as given in detail in Table II.

Is is not strange that American manufacturers ship less equipment to Belgium than does Germany, in spite of the fact that our shipments to France are almost double those from Germany? In this connection, it should also be remembered that these German shipments to France include a rather substantial volume of equipment shipped as "Reparation in Kind," a form of competition that is peculiarly difficult to meet. Contrast the trade of Germany and Great Britain, as illustrated by the experience in Italy and in the Netherlands. Notice the relatively inconspicuous volume of American equipment in the Balkan States and Poland. Contrast conditions in all of these countries with the American position in Great Britain. Do not these figures suggest that we are missing opportunities in Australia? As has been suggested by President Hoover and a number of others, this is unquestionably a time when American manufacturers of metal-working machinery can reconsider their export business profitably. Conditions in many countries suggest that stronger sales effort would be justified, sales effort of the kind that will support quality machinery and production machinery adequately in the face of competition from cheaper and

Table I—U. S. Exports of Metal-Working Machinery (In thousands of dollars)

Year	Asia	Latin America
1910	156	476
1913	199	799
1919	8,815	3,262
1920	7,427	4,068
1921	5,137	3,360
1922	4,326	1,647
1923	2,386	1,993
1924	2,581	1,844
1925	1,821	2,766
1926	1,638	2,718
1927	1,977	2,636
1928	2,373	2,977

standard types as produced in foreign countries. But in making this recommendation, it should also be emphasized that there is no occasion to indulge in unbusinesslike practices that would demoralize business. The $40,000,000 worth of export orders that was received by American manufacturers during the year just closed was a very valuable volume of business, but it is equally desirable that this trade be expanded upon a basis that is at once clean, attractive, and profitable. Good salesmanship should accomplish this, but it should be remembered that export business is essentially long-term business, and cannot be used as a temporary refuge when domestic sales drop.

The importance and full significance of this export trade in machinery is probably seldom appreciated. Reports covering the first nine months of 1929 show that for the first time the volume of machinery exports exceeded all other classifications, being even greater than raw cotton, copper, petroleum, and the other items that have so long occupied the top positions. Considering only exports of strictly industrial machinery, these exports are nearly one million dollars a working day—a truly amazing volume of equipment, and a trade of most unusual significance, not only for its value in dollars, but because the employment of this huge volume of machinery is releasing forces of the greatest social and political, as well as economic, importance in most countries. Asia has absorbed more than one billion dollars' worth of industrial machinery since the Armistice, Latin America more than $750,000,000. The consequences of the employment of this huge volume of equipment should be given ample recognition, as well as the mere day by day dollars-and-cents business opportunities so represented.

Table II—Distribution of Metal-Working Machinery Exports From the Three Leading Countries

Importing Country	(Exporting Country) Germany, 1928	U. S., 1928	United Kingdom, 1927
Belgium	$1,079,284	$947,494	$63,931
France and possessions	2,632,348	4,690,227	335,404
Italy	1,682,168	876,730	35,083
Netherlands and Dutch Possessions	2,717,147	829,826	34,873
Norway and Sweden	1,148,839	619,589 (c)	48,684
Austria Hungary	1,923,703	*70,450	†
Balkan States	2,210,972	60,034 (d)	262,226
Poland	2,181,436	76,876	1,801
Portugal	121,006	47,185 (f)	38,786
Russia	7,006,177	1,343,565	37,623
Spain	738,420	307,975	162,974
Germany		2,615,427	79,991
Czechoslovakia	3,602,299	801,761	†
Egypt	60,026	†	22,950
China	515,703	48,584 (e)	60,739
Japan	611,459	1,424,664 (g)	154,876
Argentina	1,793,408	524,694	444,204
Brazil	823,457	649,160	110,985
Rest of South America	471,160	738,201	49,015
Mexico and Central America	279,409	689,266	†
U. S. of America	825,125	(a) 123,033	17,860
Ireland	5,717	1,159,893	†
Great Britain	2,490,381	6,345,090	
Canada	41,447	6,937,761	16,308
Australia	228,910	669,279	838,216
British South Africa	118,147	317,604	398,420
British West Africa	17,865	†	†
Other countries	3,556,802	1,210,441	4,496,573
	$38,882,815	$34,124,809	$7,711,522

Notes—
(a) Exports to Philippine Islands.
(c) Sweden only.
(d) Roumania only.
(f) Includes Portugese East Africa.
(e) Exclusive of Hong Kong, Macao, and leased territories.
(g) Includes Formosa and Japanese leased territories in China.
* Austria only; imports into Hungary not great enough to be classified separately.
† Not separately classified.

Table III—United States Exports of Metal-Working Machinery For the First Ten Months of 1928 and 1929

Classification	First Ten Months, 1928	First Ten Months, 1929
Power-driven metal-working machinery	$21,508,167	$27,869,772
Engine lathes	1,407,621	1,763,643
Turret lathes	917,604	1,183,407
Other lathes	1,418,159	1,567,304
Vertical boring mills and chucking machines	197,129	398,669
Thread-cutting and automatic screw machines	966,027	1,211,290
Knee and column type milling machines	726,019	1,019,527
Other milling machines	1,197,764	1,214,432
Gear-cutting machines	892,873	1,211,946
Vertical drilling machines	451,437	385,911
Radial drilling machines	327,879	272,802
Other drilling machines	506,832	593,456
Planers and shapers	651,530	785,655
Surface grinding machines		242,382
External cylindrical grinding machines	1,856,594	1,582,337
Internal grinding machines	779,241	1,026,675
Tool grinding, cutter grinding, and universal grinding machines	393,021	497,430
Other metal grinding machines	643,787	908,636
Sheet and plate metal-working machines	2,246,322	2,799,696
Forging machinery	717,964	1,234,665
Rolling-mill machinery	542,800	1,347,148
Foundry and molding equipment	937,647	1,637,367
Other power-driven metal-working machinery and parts	3,729,917	4,985,394
Other metal-working machinery	$5,230,444	$6,316,166
Pneumatic portable tools	1,327,019	1,778,772
Other portable and hand or foot operated metal-working machines and parts	791,506	1,012,301
Chucks for machine tools	195,825	244,346
Drills and reamers	544,895	764,443
Taps, dies, screw plates, and pipe stocks	1,278,192	
Pipe stocks, pipe dies, and pipe cutters		509,530
Other thread-cutting die stocks, screw plates, taps and dies		889,862
Other metal-working machine tools	1,093,007	1,026,912

The details by classes of the above exports are shown in Table III, from which it will be noted that there has been a consistent increase in every class of equipment with the exception of drilling machines and cylindrical grinders. This may suggest that these types of equipment should be supported by a more consistent sales effort, although it is quite possible that the figures are not so significant as they may appear, provided the volume in 1928 was abnormally large.

Metal-working machinery is now being exported at the rate of $130,000 each working day. If these results can be achieved through the efficient efforts of a few equipment builders, what might the possibilities be if all of them should adopt the methods of the few?

The Exact Outlines of the Blanks for Nash Fuel Tank Covers Are Determined by Careful Experiment

By Frank J. Oliver, Jr.
Western Editor American Machinist

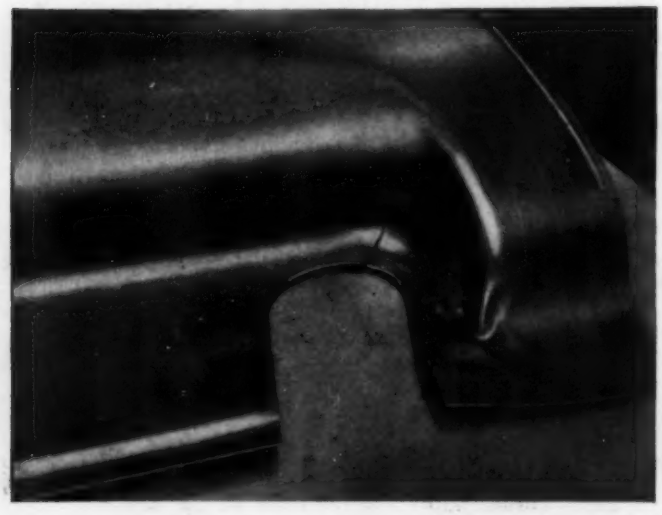
Fig. 1—Plain blank having failed in the draw area, the rupture was analyzed to determine what part of the sheet might be notched to relieve the strain

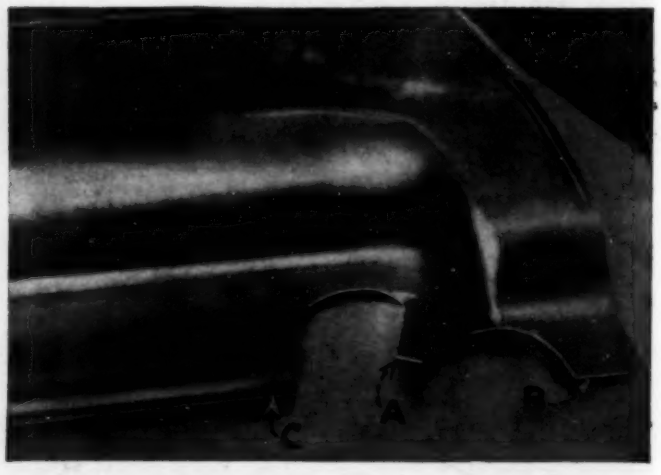
(Photographs by courtesy of the Nash Motors Company)

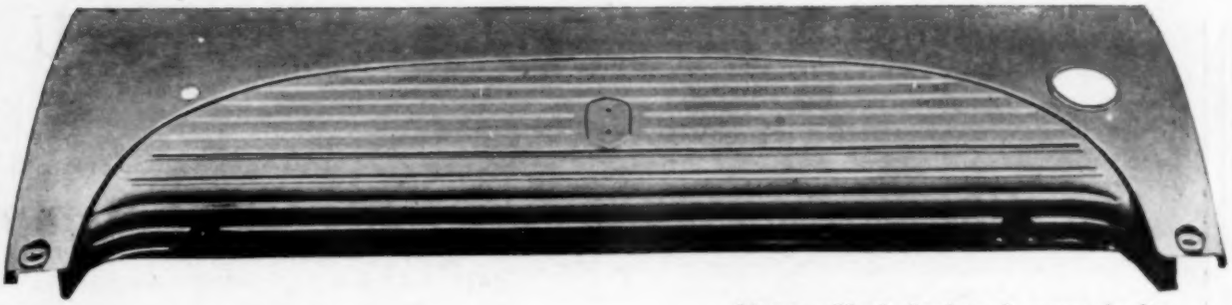
IN THE preliminary draw of a large sheet metal piece, such as the Nash fuel tank cover shown in its finished shape in the headpiece at the right, it is almost always impractical to pre-determine the exact outline for the blank. The number and size of the relief perforations must be worked out experimentally in the shop. First, the sheet is scribed with 1-in. squares in the draw area. It is then put through the press so that a study can be made of the resultant failure. The distortion of the squares indicates the condition of strain. The sheet is locked at the back and sides, but is allowed to draw over a bead at the front.

Since the sheet splits when drawn from a plain blank, the next step is to experiment with perforations in the edge. This procedure is only possible, of course, because this part of

Fig. 2—The first attempt at relief, though not entirely successful, led to the final solution, pictured in Fig. 3 at the right







Above—Nash fuel tank cover in its completed form

the sheet will later be blanked out. A study of Fig. 1 indicates that not enough metal is allowed to flow into the area of greatest strain. A perforation is therefore made in the edge, as shown in Fig. 2. Failure still occurs, though not so marked as in the first instance, but rupture is in a different direction, almost at right angles to the first split.

A study of Fig. 2 indicates that if a second, but smaller, notch were made in the blank at a position between the first perforation and the outer right-hand edge, the metal would tend to swing around the corner, which crumpled in the first instance, and besides relieving this outside corner, would bring sufficient metal to relieve the strain in the inside, drawn corner. This is done in Fig. 3, and the result is a successful draw. The swing action referred to may be observed by the edge *A* being pulled out of line with edges *B* and *C* in the blank.

The full sheet, as finally perforated, is shown in Fig. 4, and the appearance, after the first successful drawing operation, is shown in Fig. 5. In this illustration, the locking grooves at the rear and at the sides near the drawing areas can be noted, as well as the drawing bead at the front of the piece.

The result of attempting to draw the same sheet ½ in. deeper is shown in Fig. 6. The same die set is used as in the previous examples, but the punch is lowered the amount indicated. It is obvious that, in this case, no amount of sheet relief will prevent rupture of the blank in the draw.

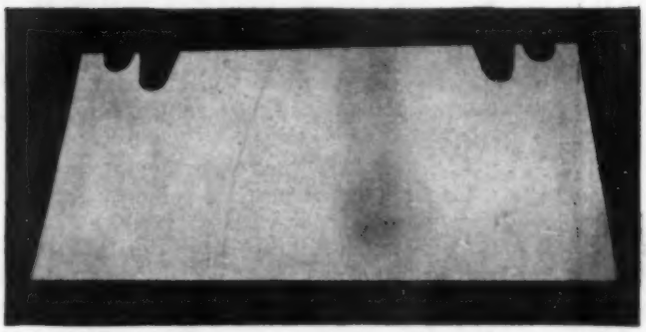


Fig. 4—Perspective view of the entire blank notched in four places

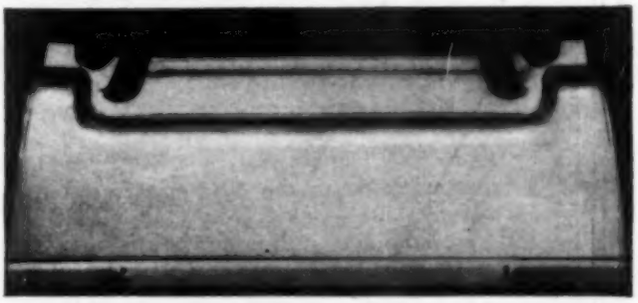


Fig. 5—The shell as it appears after the first drawing operation. It must be drawn a second time and embossed before assuming the final shape shown in the headpiece

Fig. 6—Complete failure results when an attempt is made to draw the cover ½-in. deeper than called for

EXECUTIVE · FORUM

To Whom Should the Chief Inspector Report?

CAMPBELL RIGGS, president and general manager of the Express Machine Works, was choosing his words with an exactitude and an iciness that matched the quality of his temper. It was often said of Riggs that he never became boiling mad, he just froze up.

"McPherson," he was saying to his works manager, "this is no time for ordinary alibis and common-or-garden-variety excuses. We have not only had a full carload of crankshafts rejected, refused, and returned; we are threatened with a double-barrelled law-suit for breach of contract and for damages resulting from the breach. You knew that these shafts were to be both statically and dynamically balanced before shipment. The order was explicit. How in time could you let them slip through with no more dynamic balance than your young son has in his kiddy-car?"

"But, Mr. Riggs, those shafts were only for stationary engines, and farm engines at that. You know and I know that most customers don't pay any attention to the difference between dynamic balance and static anyway. The National people were hounding us for delivery on that special lot to go into some engines for the Argentine, and I told you before that I told Bill to take a chance and shove them through. I'm taking the blame. I'm not trying to side step the responsibility an inch, but it's not the first time we've taken the same chance, not by a long shot. Why, you remember yourself how we laughed about that lot of cams we slipped over National before, and got away with it."

Bill, the Chief Inspector, spoke up, "That's right, Mr. Riggs. To tell the truth, I'm between the devil and the deep blue sea half the time anyway. Half the time, the sales department doesn't mean all it says on a factory order; we've got a system of sending a copy of the factory order to the customer, and sometimes the boys like to impress him with fancy specifications. I know it's up to me to use my best judgment, but sometimes it is next to impossible to keep from falling down. After all, I'm working for Mr. McPherson as well as for the company, and neither of us is here to take orders dumbly."

McPherson nodded his complete approval. Riggs showed signs of thawing.

Turning to the sales manager, Riggs said, "Mr. Severance, what have you to add to this symposium of honest confession and tacit criticism? I'm beginning to feel our set-up may be unmodern, and unwieldy."

"Mr. Riggs, I may just as well come clean with Mac and Bill. We do like to impress our customers with businesslike specifications; and I'll say for Mac and Bill that they do their level best to live up to them. But elaborate specifications have come to say the same thing as 'rush' on an order. Either we'll have to say 'super-specifications,' as we do 'extra-rush,' or we'll have to reform. I'm not a production man, but I'd like to make a suggestion."

"Glad to have you," said Riggs.

"Why don't we have the chief inspector report direct to you rather than to McPherson? Secretly, I've thought many times that he ought to be controlled by the sales department, but I'm beginning to see that the general management stands for the firm as a whole, and I'd like to see how the thought will work out in practice."

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What Do You Think About This Executive Problem?

To whom does the chief inspector report in your company, and how does your system work out? Would it be best to have him report to the general manager, or would it be better still to have him report to the chief engineer? Or to an inspection and standards committee?

Every operative and executive has one opinion or more on the subject. All shop men have heard it argued these many years. American Machinist invites you to write in your own ideas and discussions for publication.

DISCUSSION

OF PREVIOUS PROBLEMS

Making a Manager Out of a Foreman

Since it is not possible to give a department foreman the full financial responsibility of his department, why give him only part of it, and try to hold him responsible for the whole? This is precisely what you would be doing if you gave him an allotment with which to run his department. The overhead of any department is not made up wholly of the monthly expenditures which a foreman could control; by far the greater part of the overhead is made up of depreciation on machinery and other equipment, light, heat, power, taxes, maintenance, and other items.

There is possibly not a foreman in the country who had full say of his department from the start as to what equipment and machinery went into it, and certainly not much to say about the department's location; therefore, why hold him entirely responsible for the maintenance cost of what he inherited? About the only thing one could hold a foreman responsible for would be his supplies and non-productive labor cost. Should you limit the allotment to his department for these items only and pay him a bonus on his savings, you would be working on only a small portion of all that constitutes the total expense of the department, and there would be a tendency on the part of the management to lose sight of the larger issues.

There is danger, too, of the foreman being parsimonious. If his department is a machine shop or tool room, he may not requisition from stores a sufficient amount of oil, waste, wiping rags, drills, taps, reamers, cutters, etc., adequately to supply his department. When business is such that additional help is required, the foreman, with an allotment and a budget in sight, is going to hesitate before requisitioning sufficient new small tools and supplies. The delays which may occur will run up the costs of the jobs before anyone can stop them. William Holland is right, the foreman isn't built for it; if he were he'd be a manager.

—HAROLD LAMB, *Master Mechanic, Hookless Fastener Company.*

The Night Shift

The points raised in this discussion confirm strikingly the writer's own experience when acting as a rate-fixer. On many occasions it was found that the night foreman had to ask for increased rates on the work his men did in order to enable them to make their jobs pay, although the satndard rates were quite satisfactory to the men on the day shift. On night work the output per man decreases, and there seems to be no way to avoid the difficulty.

Our practice was to add 15 per cent to the estimated labor cost in quoting on jobs that required continual overtime or night work. It was never conclusively proved that the double shift resulted in greater profits to the firm.

The question of night work involves a consideration of the saving in overhead which it is supposed to bring about. But how many executives know exactly how much it costs per hour to run any particular shop? It is obvious that some of the expenses are practically stationary, irrespective of either the output or the hours worked. Considerable saving in overhead must be made to compensate for the usual 50 per cent increase in the wage rate on the night shift and the reduced rate of output per man obtained.

—T. H. HARGRAVE, *Lancashire, England.*

Friendliness in Business

Every salesman knows that one of the first essentials in business is friendliness. Each purchase has its corrollary in salesmanship. If the salesman desires to "come again," he knows that a square deal is the surest means of retaining custom.

But on the other hand, ordinary common sense demands that the purchaser safeguard his own interests by occasionally checking up prices and qualities amongst competitive suppliers.

One large firm of car equipment manufacturers has given away hundreds of small radio sets to its customers, simply to maintain that human touch of friendliness which they find so essential.

Although this practice has its drawbacks, it demonstrates the confidence the manufacturer has in his own productions.

—F. A. THACKER, *Coventry, England.*

Does a Highly Developed System Pay?

There are systems so completely tied up with red tape that they cost more to operate than they gain in added production. Then again, there are systems which are simple in character, easy to install and operate, which have helped double the productive output of a factory within a short period of time. But throughout my many years' experience with various systems, I have found that flexibility is required in every one of them, plus continuous checking up. Without this flexibility a system does not fulfill the purpose for which it is installed.

To illustrate, I shall attempt to describe a system in a large motor building concern which I helped install some years ago. Although we manufactured most of our motors for stock, we were continually confronted with the task of building special motors on short order, and these had to be worked into the regular production program. In order to meet rigid delivery dates without interfering with the regular production program, we arranged our schedule.

Considering four weeks as a monthly period, we set aside three-quarters of this time for the regular program, and allotted the other quarter to special orders. If the special orders were not great enough, we would work in addi-

tional quantities of standard parts for the regular stock assemblies. With this point covered, we proceeded to work back from the original delivery date to the time when the various parts must be put into operation, so that the completed special motors would be ready for delivery on the specified date.

To this date we added five days for possible delay, such as machine and tool breakdown, material trouble, and slowness of operation. Adding in the allowed time between operations, we found that ninety-five per cent of these special motors were completely assembled, tested on the block, and ready for shipment three to five days ahead of schedule. This was the means of building up a heavy business in special motor orders and a pleased lot of customers. We learned that, by following this plan, we ran into very little of the difficulty which we had experienced in the past. When confronted with serious problems we would find that, instead of being a number of days behind schedule, we were still ahead of schedule. Thus we eliminated the unnecessary haste and disorder which had always pursued such cases in the past.

If a system is installed along common-sense lines, not too complicated in nature, and with a thought given to unforeseen events, very little trouble will be experienced. Such a system, if manned by the proper type of help, should tend to overcome the many ills of poorly organized production control, increase the productive capacity of a plant, and assist in the general welfare of the employees.

—Frederic A. J. Schmidt, *Industrial Engineer.*

Does a Highly Developed System Pay?

This question must be affirmed or denied according to the character of the plant. It must be affirmed for mass-production; it must be denied for plants where smaller special orders rule. The question must be denied especially when orders come in with delivery dates which do not permit their being filled in succession. I have to run such a shop, and I must say that only half of the orders can be handled according to the existing plant-organization system, even though our system is of great elasticity. Of course a great deal of work runs automatically through the shop, but the rest needs uninterrupted personal watching. Both my foremen and I are forced to keep keen eyes on such work. If we have to effectuate an order by all means in a certain time, our manager arranges a plant-meeting in which the order in question is declared a "quick-order." With this declaration, many orders are totally based on personal initiative, and in but few cases have we failed.

A plant must have an organization, but its system should be the simplest possible, with plenty of room for personal initiative. A highly developed rigid system with its "constrained motion" is susceptible to comparatively small working disturbances.

—Franz Bermann, *Supt. Locomotive Factory, Austro-Hungarian Licensed Railway, Vienna.*

Neglecting Letters Loses an Order

In a large concern, where decentralization is necessary, it is extremely difficult to keep track of important matters without wasting time on trivialities. The handling of letters in such a manner that all incoming mail will be delivered to the individuals who should receive it and answered it promptly, is a responsibility which no one individual can be expected to fulfill infallibly.

The following arrangement, however, has met with some degree of success. All correspondence which does not fall under any definite heading is passed by the letter sorters to an elderly executive with a wide knowledge of the business. He numbers each letter to identify it and carries it to the various heads of departments until he finds the man who will assume the responsibility of its answering. He makes a record of each one, and after a short interval of time passes he follows it up to see that a reply has been sent out. If he thinks that the matter requires further attention, he refers it to the manager, and if he cannot find anyone to deal with a particular letter he turns it over to a general purpose committee.

Even with all these precautions mistakes are sometimes made. Experience has shown that greater attention to certain letters when attention was first called to them would have saved money and brought in business.

—H. James, *Birmingham, England.*

Upsetting Production Schedules

The production schedule is a plan of procedure for the shop, worked out by the commercial organization of a manufacturing plant on the basis of customer's orders on hand or anticipated. In addition to establishing the priority of shipment, it enables the shop management to lay its plans far enough ahead of actual production to insure a sufficient quantity of the right materials, adequate working forces, and suitable manufacturing equipment for the most economical production consistent with the number of parts to be produced and the time allowed in which to produce them.

The only advantage in laying plans ahead disappears and actually becomes a disadvantage when those plans are disrupted.

Sometimes a change is unavoidable, sometimes a matter of business policy, sometimes good strategy from a commercial standpoint, but it always entails waste, expense, confusion, and delay in the shop. The competent commercial organization will understand this and will hesitate long before saddling the company with the burden of even a slight change in pre-arranged production plans.

When such a change is determined upon as being the lesser of two evils and is put into effect, it should then be admitted honestly that the resulting confusion in the shop is not a result of incompetence of the shop management, but to the fact that the commercial organization simply guessed wrong.

—Wm. C. Landis, *Superintendent, Westinghouse Air Brake Company.*

Improved Spline Milling Cutters and the Work They Do

By Fred A. Firnhaber
Machine Designer,
Landis Machine Company

Cutter design plays an important part in successful spline milling

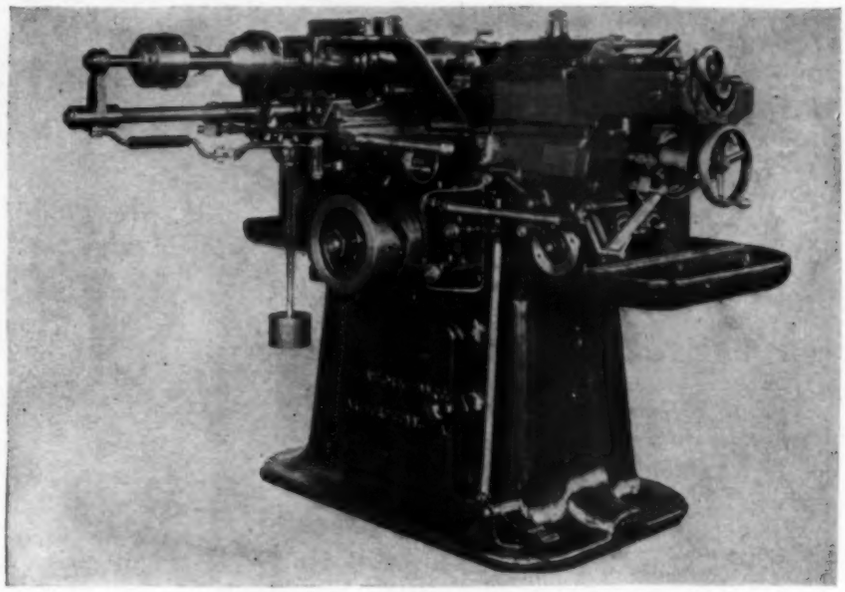


Fig. 1—A standard spline miller set-up for milling spiral cuts

DEVELOPED primarily for a special purpose, later adapted to general use, the spline miller has undergone a series of changes which have affected tools for the machine considerably. When the only job for the spline miller was the double-side machining of certain parts for the breech-loading rifle, the cutters were of necessity specialized in design. They were chucked in spindles in the machine and fed into the work by cams, in contrast to the present method of chucking in sliding heads and feeding by screws. The changes in use are reflected in the tool set-ups of today.

An example of an unusual present-day tool set-up, with a specially designed fixture mounted on a standard machine, is shown in Fig. 1. This set-up is designed for milling spiral cuts, similar to those shown in the automobile valve lifters at *C* and *D*, Fig. 10. Other spiral cuts are shown at *E* and *F* in the same illustration.

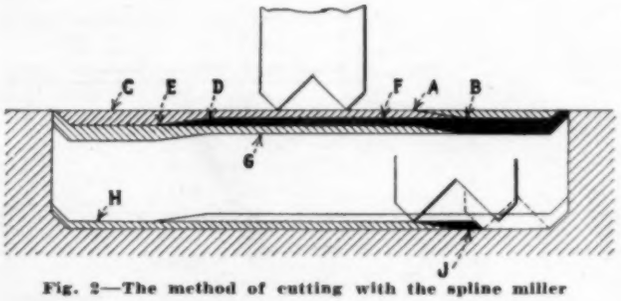


Fig. 2—The method of cutting with the spline miller

A coarse lead screw, at the upper left corner of the machine, rotates the work-holding spindle, upper center, through the longitudinal movement of the machine table itself. The lead screw, as part of the table set-up, derives its motion by passage through a stationary hard babbitt nut mounted on a bracket extending over the table from the machine proper. This bracket also supports the spindle. The foot-operating mechanism shown is utilized in order to leave the operator's hands free to load and unload. The fixture proper is self-ejecting through the long handle extending from the carriage. This handle also locks the work in place after loading. The usual fish-tail cutters are mounted in the heads.

Almost vital to successful spline milling is the design of the cutters. Ordinary end mills were first used in the machine, but a number of faults contributed to defeating their use. To begin with, an end mill suitable for the class of work done by the spline cutter must of necessity have small flutes and be of small diameter. These small flutes did not allow proper chip clearance, and consequently, the end mill jammed and broke.

The result was the old style "fish-tail" cutter, shown in Fig. 3. These cutters had cutting blades from $\frac{3}{4}$ to $1\frac{1}{4}$ in. in length. They were slabbed off on an approximate 15-deg. spiral lead angle. The blade was made thin to get the cutting edge as near the center line as possible. This was done because these edges cut ahead of the center, and had no radial rake ground on them.

Fig. 4 shows an improved form of fish-tail cutter of the double-end type, it having several important and interesting improvements over its predecessor. The opposed cutting edges are radial and shaped near the center. This gives them increased strength to withstand a heavier cut without sacrificing chip clearance.

This type of cutter cuts as shown in Fig. 2. The shorter cutting edges (*X*, Fig. 12), do the bulk of the work, the inner edges (*Y*, Fig. 12), cutting away only the core. The darkened section *J*, and the sections such as *A* to *B* and *D* to *E* near the end of the pass, are the only parts cut by the inner edges. Consequently, the tool must be so designed so as to have diametrically opposed out-

A previous article on spline milling by the same author appeared on page 961, Vol. 71, under the title "Spline Milling Spindle Design."

Cutters for the Spline Miller

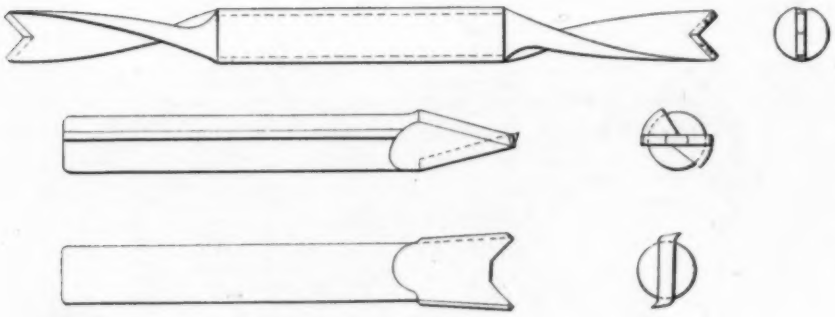


Fig. 3

Fig. 3—Early designs of "fish-tail" cutters. Cutting blades were from ¾ to 1¾ in. in length. These cutters were slabbed off at a spiral lead angle of approximately 15 deg. Blades were thin, to get the cutting edges as nearly radially opposite as possible

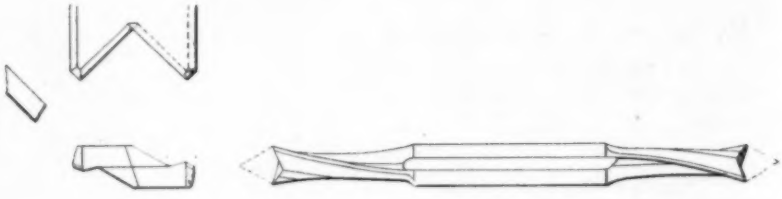


Fig. 4—An improved form of fish-tail cutter of the double-end type. Opposed cutting edges are radial, and shaped near the center to have increased strength without sacrifice of chip clearance. *A* and *B* show methods of fluting. *C* is a cross-section of the shank, showing coolant grooves

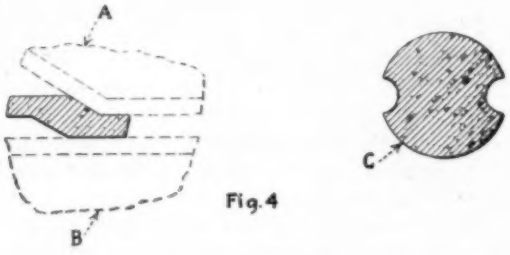


Fig. 4

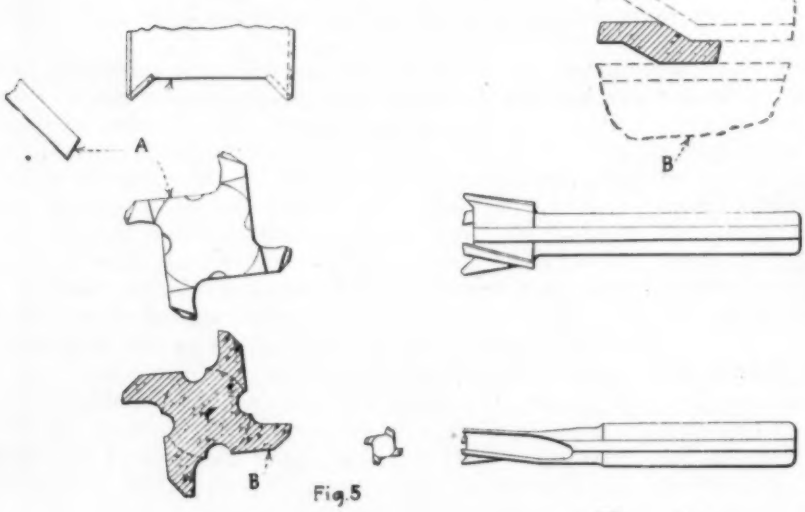


Fig. 5

Fig. 5—Modern cutters with 4-fluted heads. 5*a* has a shank smaller than the head, 5*b* a shank larger than the head. The latter may be made double ended. Coolant grooves on both types are indicated. An enlarged end view is shown at *A*, and a cross-section at *B* in the illustration

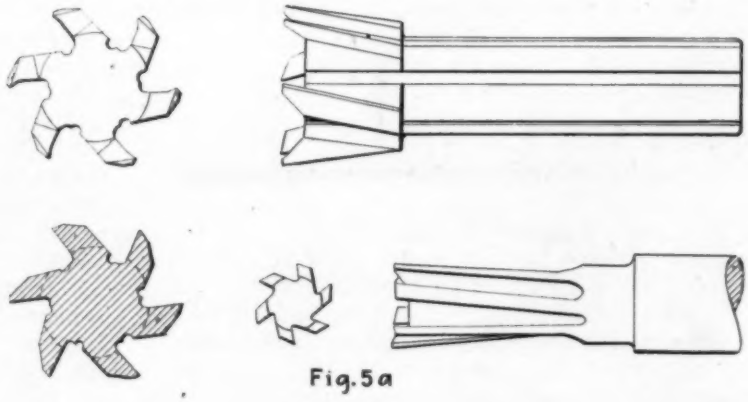


Fig. 5a

Fig. 5a—Six-lipped cutters, used only in the larger sizes. The upper cutter has a head larger than the shank. The lower cutter has a head smaller than the shank and may be made double-ended. Coolant grooves are indicated on the upper cutter

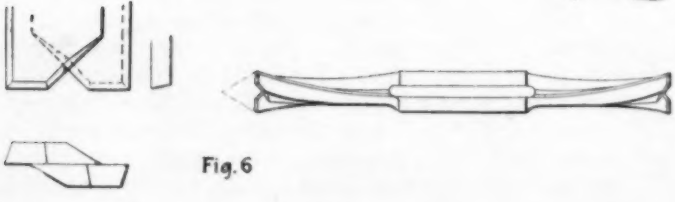


Fig. 6

Fig. 6—A square-end cutter for squaring out a slot. Used when ordinary cutters are objectionable, such as in splining for feather keys and in like jobs where a flat seat is required

Products of the Spline Miller

Fig. 7—A toolpost for a popular lathe, a typical example of the work done on the spline miller. The material is tough alloy steel. The slot is $\frac{1}{16}$x3$\frac{1}{4}$ in. The piece diameter is 1$\frac{11}{16}$ in. Floor-to-floor time, 20 minutes

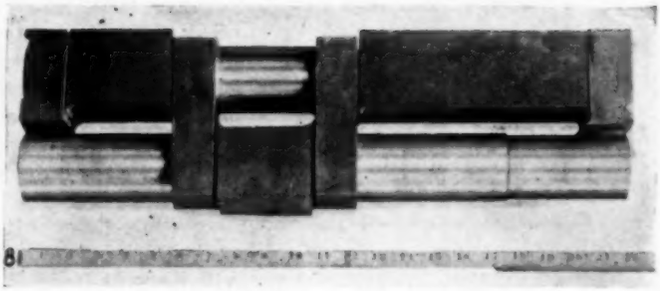


Fig. 8—A single-throw crankshaft, with cutaway stock replaced. The hogging out was done on a spline miller. An example of the roughing operations done on this machine

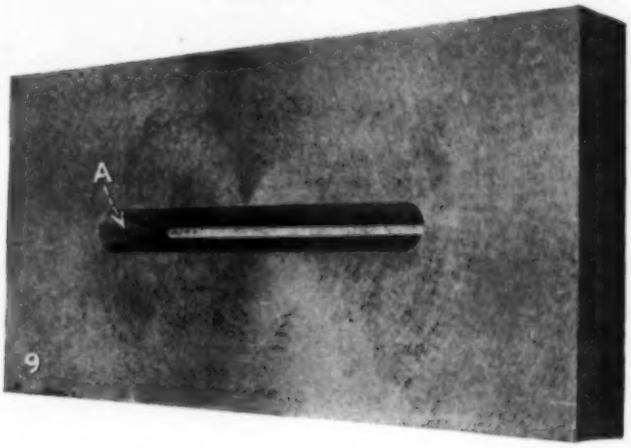


Fig. 9—A tool-steel die block with a tapered slot. A tapered cutter was used, and two settings of the tool were required. The surface at *A* shows the smoothness of the work

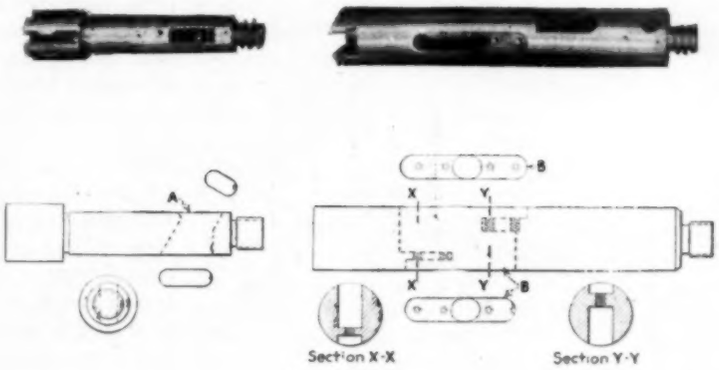


Fig. 10—Sections of tap bodies. The outlines show the nature of the jobs. These are unusual and difficult tasks for any other machine. Outlines *B* give details of the slots. The double taper at *A* is easily handled

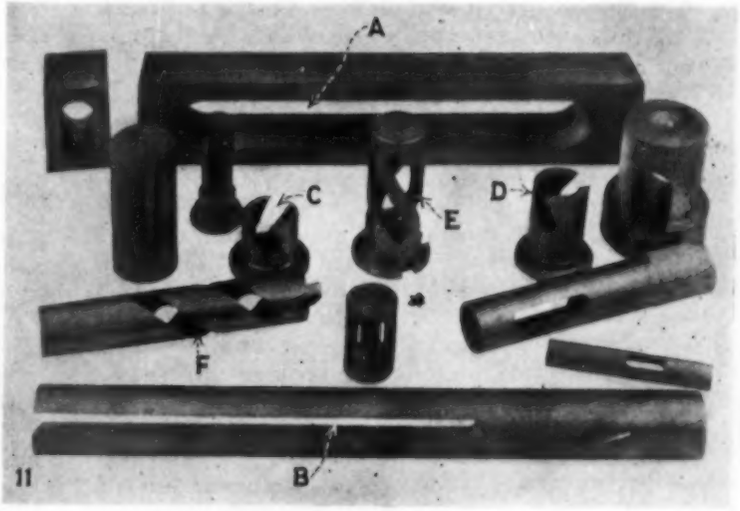
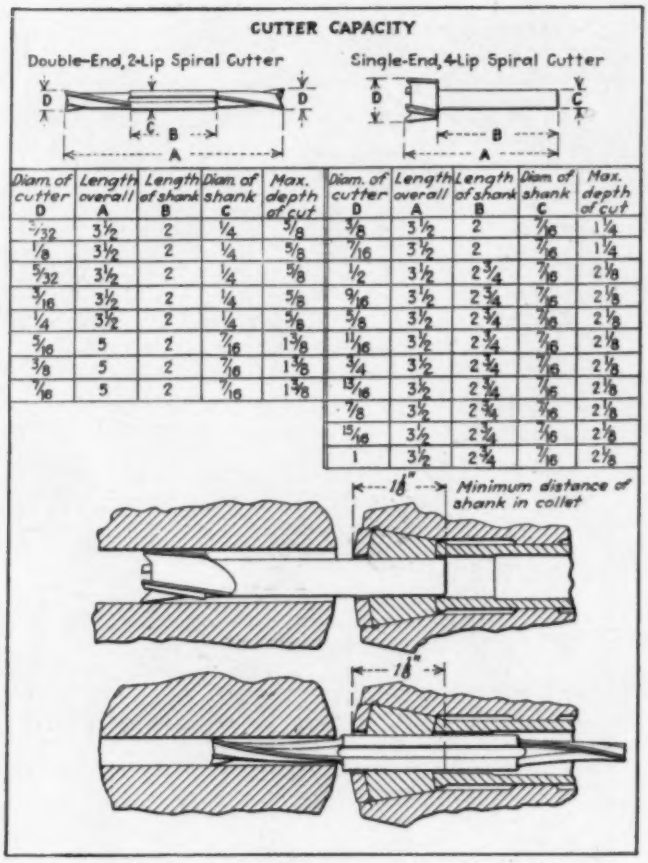


Fig. 11—A group of small parts made on the spline milling machine. Among them are several examples of spiral cuts. Parts *C* and *D* are automobile valve lifters, cut spirally to give the valve a rotative motion. Other spiral cuts are shown at *E* and *F*. Those at *A* and *B* are longer than the capacity of the machine and require two settings



Diam. of cutter D	Length overall A	Length of shank B	Diam. of shank C	Max. depth of cut
1/32	3 1/2	2	1/4	5/8
1/8	3 1/2	2	1/4	5/8
5/32	3 1/2	2	1/4	5/8
3/16	3 1/2	2	1/4	5/8
1/4	3 1/2	2	1/4	5/8
5/16	5	2	7/16	1 3/8
3/8	5	2	7/16	1 3/8
7/16	5	2	7/16	1 3/8

Diam. of cutter D	Length overall A	Length of shank B	Diam. of shank C	Max. depth of cut
3/8	3 1/2	2	7/16	1 1/4
7/16	3 1/2	2	7/16	1 1/4
1/2	3 1/2	2 3/4	7/16	2 1/8
9/16	3 1/2	2 3/4	7/16	2 1/8
5/8	3 1/2	2 3/4	7/16	2 1/8
11/16	3 1/2	2 3/4	7/16	2 1/8
3/4	3 1/2	2 3/4	7/16	2 1/8
13/16	3 1/2	2 3/4	7/16	2 1/8
7/8	3 1/2	2 3/4	7/16	2 1/8
15/16	3 1/2	2 3/4	7/16	2 1/8
1	3 1/2	2 3/4	7/16	2 1/8

Fig. 12—Cutter capacities and dimensions, as worked out by the manufacturer

side cutting edges that can withstand the stresses placed upon them.

The cutting action of the spline miller is also shown in Fig. 2. As the work travels toward the left in the illustration, the cutter starts to feed in at *A*. At *B*, the feeding-in action ceases and the cutter works directly across to the right-hand end of the slot. The table then reverses, the work moving past the cutter toward the right. The second cut *C* is the same depth as the infeed at *A* and *B* until it reaches *D*, when the second infeed starts. This infeed is finished at *E*. The third cut is shown in darkened section at *F*, and the fourth in line section at *G*. The remainder of the passes are the same until the bottom is reached. The infeed stops just before the last pass, *H*, is taken.

A square-ended cutter intended to be used when squaring out a slot is shown in Fig. 6. This cutter is necessary when a feather key is to be set solidly in a shaft. The corners of the key must be touched off or the corners broken to insure a solid seat at the bottom of the slot if the square-end cutter is not used.

Splining for feather keys is one of the important uses of the spline milling machine and the one from which it derives its name. These keys are usually sunk into the shaft to a depth equal to the width of the key, which is the diameter of the cutter. It has been found to be good practice in the case of change or slip gear shafts to increase the depth of spline 50 per cent and to buy or make special hardened keys.

When cutting through-slots, for example a drift-key slot in a spindle or an arbor, the cutters alternate in advancing beyond the center of the cut, thus insuring a smooth cut without a ridge or high spot in the center.

Examples of the types of work done are shown in Figs. 7, 8, 9, 10, and 11. A good example of cutting time on the work done is shown in Fig. 7, a toolpost for a popular make of lathe. The material is tough alloy steel. The slot is $\frac{1}{16}$x3$\frac{1}{8}$ in., and the diameter of the piece 1$\frac{11}{16}$ in. A cutting speed of 95 ft. per min. is maintained, the infeed per stroke being 0.018 in., and the table feed per cutter revolution 0.021 in. The cutting time, floor to floor, is 20 minutes.

Cutting speeds at which these cutters operate may be up to 150 ft. per min. The cutter is fed into the work from 0.001 to 0.020 in. in depth, and from a few thousandths to $\frac{1}{16}$ in. per cutter revolution, the latter feed depending upon the finish desired.

Another example of the range of work done is the tool-steel die block in Fig. 9. The slot required two settings of the tool, the junction point of the cuts being just barely visible at the center of the slot. The cuts at *A* and *B* in Fig. 11 are also longer than the capacity of machine, and required two settings.

Two ingenious jobs are shown in Fig. 10*a* and *b*. The outlines accompany them to show the cross-section of the jobs. The pieces are tap bodies used in the Victor collapsible tap, manufactured by the Landis Machine Company, Waynesboro, Pennsylvania.

In Fig. 13 is an enlarged view showing the cutting edges, which are ground at 45 deg. The outer edges leave a bevel in the splined slot equal to the height *A*, which is from 0.015 in. up to 0.030 in., depending on the size of cutter. The thickness of the cutting lip is from $\frac{1}{32}$ in. on a $\frac{3}{32}$-in. diameter cutter, $\frac{1}{16}$ in. on $\frac{3}{8}$-in. diameter, and so on, up to $\frac{1}{4}$ in. on a 1-in. diameter cutter.

These cutters are made with an approximate 15-deg. spiral flute angle, concentrically relieved as shown at *C*. The cutting angle is always 15 deg., with a small flat at *D* of 0.002 to 0.005 in. In Fig. 12 are charted dimensions of cutters that the manufacturer has found most practical and economical for various diameters. Experience has shown that if a minimum of 1$\frac{1}{8}$ in. of shank length projects back into the chuck as shown, the cutter is held rigidly enough to have as much as a 2$\frac{1}{4}$-in. overhang when cutting deep slots. Of course, at the beginning of the cut, the cutter may be chucked close to the cutting edges and the chucking changed later.

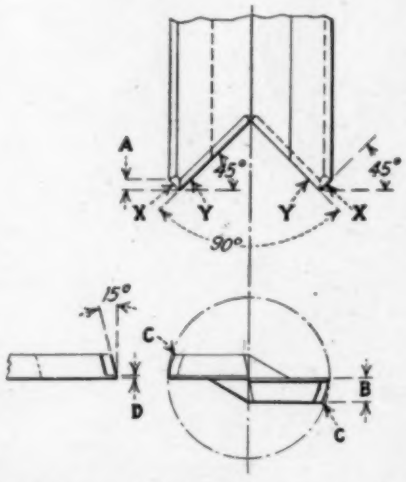


Fig. 13—Detail of cutting edges of the fish-tail cutter, showing grinding clearances

These cutters are made in various types: two-lipped, single-ended, and double-ended, up to and including $\frac{7}{16}$-in. diameters; four-lipped, single- and double-ended for $\frac{5}{16}$-, $\frac{3}{8}$-, and $\frac{7}{16}$-in. diameter, and four-lipped, single-ended for $\frac{1}{2}$-in. diameter, up to and including 1 in. diameter. In the larger diameters, as shown in Fig. 5*a*, six-lipped cutters may be used.

Just What Is An Apprentice?

By C. V. FREUND
Apprentice Supervisor, The Falk Corporation

The revival of interest in apprentice training has resulted in the establishment of many effective training courses

Successful apprenticeship means a new generation of skilled workmen for industry

IT IS somewhat surprising that there should be lack of agreement regarding the meaning of the word "apprentice" in many shops in which training programs have been established. The managers of these shops agree in nothing except the general idea that apprenticeship involves the introduction of young men into the plant plus his remaining there three or four years for training and experience. For instance, the president of a machine tool manufacturing corporation was recently talking blithely about his apprentices. As the discussion proceeded, it developed that he was speaking of the college graduates who were preparing for sales and engineering work in his organization. The manager of a certain electrical machinery plant speaks of all juvenile employees as his apprentices. In an agricultural implement shop, alert high school graduates are broken in on a single machine operation and are thus enabled to earn very good pay on a piece work basis. They are called apprentices. In a certain midwestern steel foundry all helpers are designated apprentices on the assumption that they aspire to become moulders, although, as a matter of fact, not one in a hundred ever becomes a skilled mechanic. In a plant devoted to the manufacture of heavy machinery of various kinds the term is for some unknown reason used only for erecting-mechanics' helpers. Other examples might be cited.

Despite the rapid growth of the movement, one hears many stories of apprenticeship failures:

"Yes, we tried it and everything went well for a while, then our people lost interest and gradually the whole thing died out."

"Apprenticeship is nothing in this day and age. Our young people don't want to work, and we know from experience that there is no use trying to make them."

"We have been trying for years to make apprenticeship a success in this shop. We get boys in and they are eager enough at the start, but they gradually lose interest and quit. Only a few have graduated. We are keeping at it because we feel it is our duty, but we don't accomplish anything."

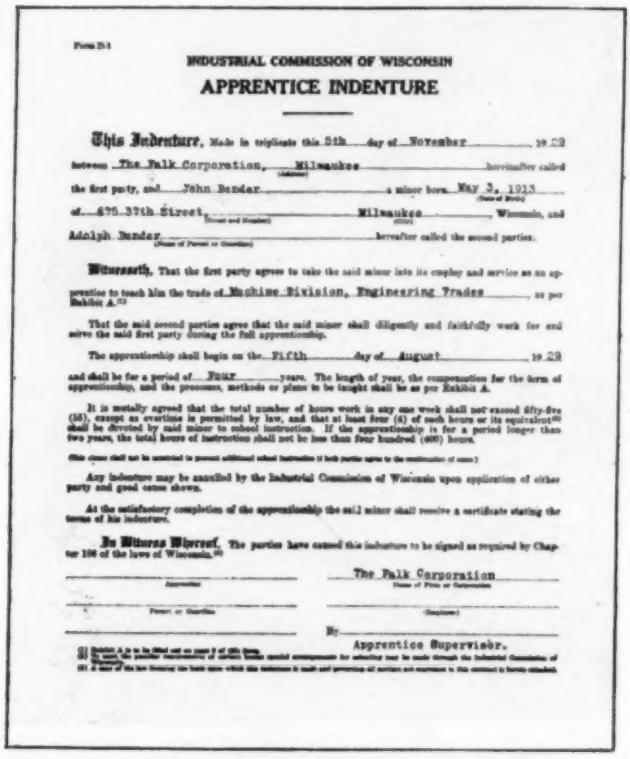
"We would like to train apprentices, but our superintendent and foremen will have nothing to do with apprenticeship, and we have never felt that we would gain anything by forcing it on them."

While listening to these stories we wonder what these manufacturers mean when they use the word "apprentice." We wonder what the exact relation between the employers and the boys has been, how the boys were handled and what efforts were made, if any, to provide formal instruction for them. We wonder if these failures have not been the result of a lack of understanding of the meaning of apprenticeship. It is impossible to carry out a plan not clearly conceived. If apprenticeship means getting boys into the shop and letting them work at random, on the assumption that four years of this sort of thing will provide adequate experience, the undertaking is bound to fail. To be successful, apprenticeship must be clearly understood in its purposes and methods, and systematically carried out.

At this point the question naturally arises, what is an apprentice? The standard dictionary gives the following definition: "One who is bound by a legal agreement or indenture to serve another person for a certain time, with a view to learn an art or trade, in consideration of instruction therein."

According to the apprenticeship law of the State of Wisconsin, an apprentice is: "Any minor, 16 years of age or over, who shall enter into any contract of service, expressed or implied, whereby he is to receive from or through his employer, in consideration for his services in whole or in part, instruction in any trade, craft, or business."

Of course, it requires more than an acquaintance



INDUSTRIAL COMMISSION OF WISCONSIN

APPRENTICE INDENTURE

This Indenture, Made in triplicate this 5th day of November 19 29

between The Falk Corporation, Milwaukee hereinafter called the first party, and John Bender a minor born May 3, 1913 of 675 37th Street, Milwaukee, Wisconsin, and Adolph Bender hereafter called the second parties.

Witnesseth, That the first party agrees to take the said minor into its employ and service as an apprentice to teach him the trade of Machine Division, Engineering Trades as per Exhibit A.

That the said second parties agree that the said minor shall diligently and faithfully work for and serve the said first party during the full apprenticeship.

The apprenticeship shall begin on the Fifth day of August 19 29 and shall be for a period of four years. The length of year, the compensation for the term of apprenticeship, and the processes, methods or plans to be taught shall be as per Exhibit A.

It is mutually agreed that the total number of hours work in any one week shall not exceed fifty-five (55), except as overtime is permitted by law, and that at least four (4) of such hours or its equivalent shall be devoted by said minor to school instruction. If the apprenticeship is for a period longer than two years, the total hours of instruction shall not be less than four hundred (400) hours.

Any indenture may be cancelled by the Industrial Commission of Wisconsin upon application of either party and good cause shown.

At the satisfactory completion of the apprenticeship the said minor shall receive a certificate stating the terms of his indenture.

In Witness Whereof, The parties have caused this indenture to be signed as required by Chapter 106 of the laws of Wisconsin.

The Falk Corporation

By

Apprentice Supervisor.

Apprentice indenture required by the Industrial Commission Law of Wisconsin. The text of the law is printed upon the back thereof. There is no law governing wages, but it is recommended that they be uniform in a community

with a simple definition to understand apprentice training thoroughly, and it may be well to amplify the definition by listing certain characteristics of apprenticeship which may be found in all shops in which the undertaking is successful. As long as we are defining terms we might as well say that when we speak of successful apprenticeship, we mean that a certain number of young men are regularly hired, that a reasonable proportion of them, more than half, complete their courses, and that the manufacturing organization is recruited from apprentice graduates.

In choosing the principal characteristics of successful apprenticeship, what happens to the apprentice during his course is more important than what he is.

Possibly the most important of these essential characteristics of successful apprenticeship is the comprehensiveness of the course. The apprentice training must cover the entire trade. In planning a training program for his shop, the employer must keep in mind that this training program will be a preparation for the young man's life work. Let him imagine a family circle in which a boy has just graduated from school. The boy and his parents, and perhaps older brothers and sisters, are discussing his future. The boy's whole life and the welfare of his future family depend upon the next few years. The apprenticeship is as important to him as the course in law or medicine is to the professional man.

Accordingly, the employer must ask himself not only "what must our apprentice course include in order to teach the boys our work," but he must also ask himself "what must the course include to make the boy a thoroughly qualified mechanic who can obtain a good position in the industry?" There can be apprentice machinists, but there can be no apprentice lathe hands, and no apprentice planer or boring machine hands. Operating any of these machines does not constitute a trade in itself. The employer would not admit a mere milling machine hand to the status and pay of an all around mechanic. Therefore, he should not deceive the boy by a so-called apprenticeship on one or two machines. Real apprentice training is comprehensive training.

In some plants, employers have felt justified in setting up a separate apprenticeship for erecting mechanics or fitters. This has been found justifiable only in the largest plants, with a highly diversified product. An apprenticeship in the assembly of four cylinder gas engines is nothing more or less than exploitation. It is a different matter if the course includes the erection of very large steam engines or pumps, turbines, hydraulic machinery, transmission machinery, smaller fittings and valves, the overhauling of machine tools, and other work.

A boy who is about to become an apprentice and his parents are quite naturally skeptical about two points. They are confronted by the fear that the boy may be placed in the shop merely as cheap labor, and secondly, that the employer may discontinue the training when the course is only partly completed. Therefore, in order to reassure the boy and his parents, a definite agreement much exist between the employer and the apprentice, which recognizes the apprentice as a learner and specifies that the employer shall teach him a trade in consideration for his services. More particularly, the agreement recognizes that learning is more important for the apprentice than producing. This means that in case of a conflict between learning and production, which conflict will seldom arise in actual practice, production must give way to learning. Of course, this does not excuse the apprentice from getting out all the work he can, because the ability to produce is after all an extremely important part of trade skill.

This agreement between the employer and the apprentice must not merely exist, but must be understood throughout the entire organization. This recalls an incident, probably an extreme case, of a young man who applied for apprentice training in a certain machine shop. Within eight months after he had begun his course we found him at work in another shop. We asked him why he had given up his apprenticeship, and he said that the apprenticeship agreement had not been carried out. Immediately we telephoned his former employer for information regarding the boy's case. The employment manager at first denied that the boy had been an apprentice, and when we crowded him a little he referred us to the machine shop superintendent. The superintendent told us that the boy had merely been working in the shop as a regular employee and had never been an apprentice.

"They told me that you never hired out as an apprentice at all," we said to the boy when next we saw him.

"That's just what's the matter up there," he answered, "I was an apprentice and I can prove it."

Without a word he disappeared into his home and returned in a moment bringing with him an indenture signed by the works manager of the corporation which had employed him.

Not only must each department head, foreman, inspector, and mechanic recognize the apprentice as a learner, but he must also recognize his own responsibility as a teacher. It must be clearly understood by all, that while the apprentice is on a machine or operation, he must be shown not only what he needs to know

in order to complete the work in hand, but also, whatever he needs to know in order to understand the machine thoroughly. When an apprentice is sent into a department to learn the operation of a boring-bar, the foreman of that department should be determined that when the boy leaves, he shall know as much about the machine as he can possibly learn in the intervening time.

There is less danger that an apprenticeship agreement will be violated by either party if it is expressed in a formal document and properly signed. Usually, both the employer on the one hand, and the boy and his parents on the other, receive copies of the indenture and both are held in check by the knowledge that a copy is held by the other party.

A written agreement protects the employer against thoughtless and reckless young men who might begin an apprentice course merely to obtain temporary work, with no intention of completing it. If such boys must bring home an imposing document which has been signed by the officers of the corporation and which must be signed by his parents and himself, he will think twice before undertaking the work. Moreover, if the parents have signed the indenture, they usually take the apprenticeship seriously and will, ordinarily, encourage and support the boy in periods of discouragement.

The contract must be fair. Obviously unfair, is an indenture which a certain employer has drawn up, which specifies that the employer may discharge the apprentice at any time, but provides no measures whereby the apprentice, in turn, may annul the agreement.

In addition to providing a certain period of work on the different machines or in the different departments of a trade, a successful training program includes arrangements for a sufficient variety of work on each machine

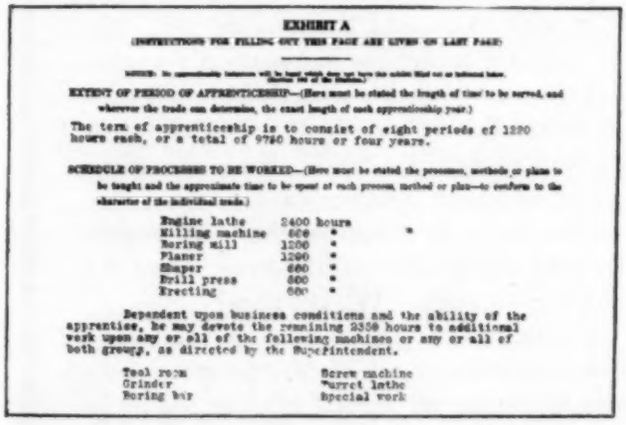


EXHIBIT A

(INSTRUCTIONS FOR FILLING OUT THIS PAGE ARE GIVEN ON LAST PAGE)

NOTED: In accordance between [illegible] as hand, which form, are here the entire [illegible] as a reference basis.

EXTENT OF PERIOD OF APPRENTICESHIP—(Here must be stated the length of time to be served, and wherever the trade can determine, the exact length of each apprenticeship year.)

The term of apprenticeship is to consist of eight periods of 1200 hours each, or a total of 9760 hours or four years.

SCHEDULE OF PROCESSES TO BE WORKED—(Here must be stated the processes, methods or plans to be taught and the approximate time to be spent at each process, method or plan—to conform to the character of the individual trade.)

Engine lathe	2400 hours
Milling machine	600 "
Boring mill	1200 "
Planer	1200 "
Shaper	600 "
Drill press	600 "
Erecting	600 "

Dependent upon business conditions and the ability of the apprentice, he may devote the remaining 2360 hours to additional work upon any or all of the following machines or any or all of both groups, as directed by the Superintendent.

Tool room	Screw machine
Grinder	Turret lathe
Boring bar	Special work

The length of time an apprentice shall spend at each process is optional, but it must be laid out in advance and filed with his indenture

or in every department. For instance, a machinist apprenticeship contract, which specifies eighteen months of work on standard engine lathes, presumes that during those eighteen months the apprentice shall be given such a variety of work that he will be thoroughly qualified on the machine. Accordingly, it is incorrect practice to permit the apprentice to devote the total period of eighteen months to roughing pump shafts. Great temptations against this rule of action constantly arise. If a foreman has had difficulty with a certain operation, and as frequently happens in such cases, he finds a docile apprentice who can do the work properly, the foreman will naturally wish to give the boy more of that kind of work than he should have, and less of other kinds.

Every trade has two phases, a practical phase and a theoretical phase, and requires both practical and theoretical training. In the machine shop, for instance, the all around mechanic must know how to set up work, how to adjust his tools quickly, how to grind them, how to use hand tools, and how to make common repairs.

On the other hand, it is equally important for him to know how to read blue prints, to understand the theory of the cutting angles of tools, to know something about the various kinds of iron and steel and other materials used, and to be thoroughly familiar with ordinary shop mathematics.

Moreover, it is distinctly advantageous for a mechanic to understand the fundamentals of economics and business administration and the principles of industrial management. This enables him to appreciate the relation of his work to the industrial scheme of things.

Accordingly, an adequate system of apprenticeship invariably includes compulsory school attendance usually a half day or a full day per week.

Circumstances will determine the provision to be made for school attendance. Vocational schools have been highly developed in many states and are equipped to give excellent service in this direction. Where no vocational school system has been built up, public schools frequently will organize the required classes for apprentices. If the manufacturing plant is isolated it will be necessary to set up a shop school, in which case, the apprentice supervisor, or members of the engineering department serve as instructors. Texts for shop classes are usually secured from reputable publishers or correspondence schools. As a rule apprentices are paid for school attendance, and such payment is enjoined by the Wisconsin Apprenticeship Law.

A most important requisite for the success of an apprentice training program is that a certain person in the organization be made responsible for the progress of the boys. In fact, a real apprenticeship is hardly possible without such an official. Apprentices are young. They have been used to guidance in school, at home and elsewhere. They may have resented this guidance, but they have never appreciated how much they depended upon it. They are not yet qualified to think their way without assistance out of the more serious problems which confront them. One apprentice will have difficulty with his school work, another wishes to have a special course of one year after he graduates, still another will get into a controversy with a foreman over crane service. There are arguments over the ownership of a micrometer and over tools that have been lost. These matters must be taken up with the supervisor because the foreman is responsible primarily for production and has not time to go into the solution of these personal problems. The foreman must teach the practical side of the trade, the operation of machine tools, and the solution of problems in connection with the work immediately in hand. Beyond this he cannot go, and the supervisor must take up the work where the foreman leaves off.

It is the duty of the supervisor to arrange apprentice courses after conference with the proper officials and to prepare contracts and indentures accordingly. Moreover, he is responsible that these contracts are actually accomplished and must maintain the morale of apprentices at the highest possible level.

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been arranged

Keeping Machines on the Job

"I HEAR that Williams is looking for a new repair man, Al," volunteered Ed on the way home. "I don't see what ails Pete Jacobs. He's been on the job a long time and knows the shop. And you can depend on him too."

"Yes, Pete is a good man on repairs. But Williams wants more than that. He wants a maintenance man."

"What's the difference, Al? Seems to me it's just another name for the same job."

"That's where you're wrong. And that's what ails Pete. It's what ails the so-called maintenance men in a lot of shops. They are good at repairing machines after they break down, or when we foremen tell them what must be done."

"Well, what more do you want?"

"Maintenance means keeping machines running and not waiting for them to break down. Pete ought not to wait for orders before he tackles a job. A real maintenance man keeps tabs on the machines and motors, and the like, and doesn't wait until they quit. He plans his work much as we do and knows how long it is since he has looked over each machine or motor."

"I'm not sure I want any of that kind of men in my department, Al. I rather they would keep out till I send for them. I don't want them laying up a machine I need just because they get a notion it ought to be looked over. I'll tell 'em when I want them."

"A maintenance man who has any sense and who wants to keep his job isn't going to put machines out of commission just for the fun of it. He'll only do it when it will save a much longer delay later. And if you are on a special rush job, he'll let the machines run just as long as it seems safe, to help you out. But it puts the responsibility of shutdown up to him instead of to you."

"But why can't Pete do that as well as a new man? Has Williams told him what he wants done in that line?"

"I've heard Williams tell Pete a dozen times that it was his job to plan his work to forestall breakdowns wherever possible, and not to wait to be told about every job. He told him he'd rather see him make a few mistakes than not to tackle something on his own initiative. But he's evidently not cut out to go ahead on his own hook. Since this came up I've heard of another case just like it."

"Must be a new notion, Al. All repair men used to wait for breakdowns. And we got along all right. Why change?"

"You've got enough to do to get out your work, Ed, without taking charge of maintenance in your department. It's just one more subdivision of labor that comes as we get better shop methods. And it gives the maintenance man a chance to make a better job for himself. I'm sorry for Pete, but if he can't play the game a new man will have to be put over him."

Should the foreman be responsible for maintenance of his machines. Or is it better to have a competent man for this? Who should say when to put a machine out of commission?

All foremen are urged to discuss these questions vital to their work; of course the discu

ROUND · TABLE

DISCUSSION OF EARLIER TOPICS

What You Do, Or What You Get Done?

THE efficient man always has time to be interrupted. His work is so organized that it does not require all his time, and he puts himself in line to gather new ideas by always being accessible to callers. The man who handles his job in such a manner is usually considered more competent than those who are always rushed for time.

When I was first placed in charge of a squad of 25 draftsmen, I thought it a rather foolish rule that a squad-chief should not do a lick of actual drawing. After a few weeks of obeying this rule, even though that entailed loafing part of the day, or mentally reviewing the past few days and thinking of the coming days, I saw the wisdom of it. For one thing, it leaves the foreman free to take up any man's problem, and to walk around the department looking for problems. Oftentimes I could stop a man from traveling along the wrong track, and prevent a great deal of mis-directed work that otherwise would have had to be done over.

From a purely mathematical standpoint, if a foreman has 25 men under him, and if he "idles" all his time, and thereby increases productivity 4 or 5 per cent on the average, he has produced more through the gang than he could possibly produce through his own efforts, and he has added a great deal more indirectly, in bettering the quality of the work, in pepping up the spirit of the men, and in generally making his shop a better place in which to work. —J. M. BENTON.

WILLIAMS is right: A foreman's duty is to get the most out of his department. What little personal work a foreman can do is but a small portion of the total production of his department. By doing this work he neglects his more important executive duties, so that the loss in efficiency throughout the department is greater than the slight gain from the foreman's personal work.

The shop foreman should not be expected to do the work of a specialist in any one particular line. His business is that of an executive, and his routine duties keep him busy. On the other hand, I like to see a foreman who can, in an emergency, jump into overalls and do any job in his department. An occasional demonstration of this kind is a good thing to show the men that the boss "knows his stuff." It will increase their respect for him. —H. M. DARLING, *Engineer, Perkins Machine & Gear Company.*

The Ethics of Making a Change

WHEN a change of position is contemplated the average person is prone to allow personal considerations to outweigh the ethical side of the question. However, a company's policies regarding its employees have much to do with a man's loyalty to that company.

Much also depends on a man's character, his inherent loyalty, and his ambition. Supervisors are seldom lacking in ambition, and satisfaction usually comes to an end when a man feels that his ability has outgrown the position he occupies.

In the final analysis, however, it must be remembered that every man, be he executive or floor sweeper, places his ability, experience, and knowledge upon the labor market for the highest returns obtainable; just as the manufacturer markets his product for the best price he can get. —GILBERT G. COOMBS.

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Who Shall Be Laid Off First?

IN ONE of the smaller shops, when business was slack, a "skeleton crew" of 16 men were retained. These were all specialized workers, a few all-around workers being included among them. During busy times 10 to 15 extra men were taken on. When the work slacked down again, only the 16 men of the skeleton crew were kept.

It would be fair to shorten working hours for all employees if it was known that the slackness would only continue for a short length of time. For any great length of time it would not work out so well. No one would get a decent salary, and it would not be fair to the specialized workers. —EDWARD V. PIRANIAN.

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Compulsory Membership in the Mutual Aid

THE question of insurance is always one thing that has to be sold, especially to the young man. His immediate expenses are most important, and with youth, health, and a good job, he feels that sickness and the need of money will not touch him. The younger man is more of a gambler with fate than is the older man who knows that sickness and accidents happen regardless of age.

Membership in the mutual aid should be compulsory. The foreman should investigate each man who will not join of his own free will and convince him of the importance of providing for the needs of his family in the event of sickness or accident. These very men who will not save for a rainy day are just the ones to expect the other men in the department to give out of their savings to carry him over a period of hard times.

—EDW. H. TINGLEY, *Secretary, National Association of Foreman.*

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Should the Workmen Share Responsibility

ED TOLD the man to machine and drill twelve castings. He also told him to get out a special jig and use it for that job. Ed knew that the jig could not be used in the regular way, but he neglected to tell the man about it. The man did the job in the usual way and

discussion is not limited to foremen. Letters accepted and published will be paid for

spoiled it. He was not to blame for spoiling the work, and the foreman was not justified in firing him because of it. After seeing the work spoiled, the foreman lost his temper and fired the man. The man was right when he told the foreman that he would do the same thing over again under the same circumstances, and, in this particular case, he was also right in saying that all he was paid for was doing as he was told. In this case the man got the directions for the job from the foreman, and did as he was told. No responsibility rests on him.

—ART SCHROEDER,
Ford Motor Company of Canada.

NO FOREMAN should have the authority to discharge a workman in a fit of temper any more than he should be in a position to take one on in an excess of benevolence. If for any reason a good workman cannot fit into one department the "super" should have the chance to find a place for him in another.

I have often heard foremen tell workmen that they are paid to do as they are told, and not to think, when the workmen have taken on themselves the responsibility of using their own initiative or have asked some question that they regarded as silly or unnecessary. In any case, the responsibility of a workman in a production shop must practically be limited to the carrying out of instructions. If the foreman does not or cannot check over the first piece of a batch or give unmistakably clear instructions, he must give the workman the facilities for checking over his own work. In many shops this seems to be economically impracticable.

—H. JAMES, *Birmingham, England.*

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Tempering General-Purpose Tools

IF THE heat-treater could know more about the service conditions of the tool and the service that it is rendering, he would be in a better position to modify his methods and adapt them more effectively to the case at hand. This explains, perhaps, why so many old timers with 30 or 40 years' experience back of them are able to show better results than a younger man equipped with a college education and the most up-to-date pyrometric equipment.

Another condition often encountered is the entire lack of co-operation between the production men and the heat-treating department. In one instance, considerable complaint was made by the production department that the heat-treating department was not doing a good job. Investigation proved, however, that the tool had checked and cracked from improper grinding, but the situation was discovered only after considerable buck passing between the several departments.

—I. L. KENTISH-RANKIN.

CERTAIN tools, such as chisels, riveting sets, and punches need more personal attention than the average heat-treating department can give. It is believed that automatic controls and specifications, while necessary for good results in tool work, are not sufficient to insure the best working results. What is needed is the personal touch. Of course, it is not suggested that regulated heat-treatment is a failure, but there is still a great deal of personal experience needed, besides automatic controls and specifications, in producing the highest grade of work. —HARRY KAUFMAN.

Paying for Dependability

IS DEPENDABILITY in a workman an asset to his company, and should it be compensated for in extra pay? Is a workman who is consistently dependable worth more than one who is rapid and who turns out work of high quality, but is not dependable? I have had experience with both types, and prefer the dependable man every time, gladly paying him extra for his dependability.

Close observance of details will sometimes forecast a man's character even before he is hired. I give two extracts from replies received to a newspaper advertisement for machinists. "I hereby make application for position as machinist. I am an A-1, all-round machinist, who can do your work. Please name your highest rate." The other read, "Answering your advertisement in today's paper I wish to be considered for the position. I feel that I am competent, and assure my best efforts if given a trial. Thanking you for a reply." Who got the job? And which answer indicates dependability?

—RAYMOND H. DAUTERICH.

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More Ways Than One

A SHOP is like a vast machine, capable of doing as much work as its various mechanisms can handle without jamming or breaking down. Its operator, the foreman, can make it work faster and more accurately by constant care and timely adjustment, but when his shop is over-taxed, he is powerless to make it produce good work. The foreman should not always be blamed when work is not finished on time or is not up to certain standards.

A foreman who receives a job that cannot be handled in the regular way, because of lack of proper machinery, should be able, if he is at all practical, to rig up some makeshift method that will do the job with the equipment at hand. If the work is not up to specifications, the responsibility does not lie with the foreman but with those who took the job without a knowledge of the shop's limitations. —WILLIAM A. VEIT.

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Games at the Noon Hour

WHEN men are working at the fast pace of modern production, they are under a heavy nervous strain caused by the speed and monotony of their work. Anything that will absorb their attention during the noon hour will be beneficial. The noon hour activities do not last long enough to tire them, but provide just enough change to relax and rejuvenate them. By exercising other parts of their mental and physical makeup, the men become freshened and regain much of the poise and balance they had when work started in the morning. Thus the noon hour games serve as a sort of balance wheel and provide a means of keeping the men of the organization alert and on their toes. —L. O. BROWN, *Toolroom Foreman, Holcomb and Hoke Manufacturing Company.*

KEEPING men busy during the time that they are together on the company's property is a problem to which the wise executive will give careful consideration. During the noon hour, and before the whistle blows in the morning, it is not unusual for men to gather in groups to discuss affairs of mutual interest. Very often the talk drifts to their work, wages, and working conditions. It

is at this time that the agitator, either amateur or professional, gets in his most effective work. If the time is taken up with some kind of game, or a discussion of it, there is less chance for a trouble-maker's having an audience. Although I know of no statistics to prove the fact, it is my belief that the labor turnover in shops where some kind of recreational facilities are provided is less than in the old-fashioned concern where the men simply loaf during the noon hour. —WILBUR C. WILSON.

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A Bonus for the Ambitious

IF A group of foremen are asked the question, What do you think of correspondence courses for your men? there will be as many different answers as there are men in the group, but it will be found that the majority incline to the opinion that the general idea is good, the trouble being in the details. If the factors that enter into the employee's decision to take up a correspondence course are analyzed, it will be found that a desire to increase his present pay envelope predominates, and secondly, a desire for the prestige that comes with a better job. But the first consideration outweighs the second, five times over. At this point the guiding hand of a wise foreman is of great service to the prospective student.

There is no question as to the worth of the correspondence course. The trouble encountered today, in this respect, is the lack of interest in those who should be most interested in the student's progress, and who are competent to advise and aid him. This is one reason why many who start a course never finish it.

—E. R. SHIELDS,
Oakland Motor Car Company.

EMPLOYEES should be encouraged to improve their knowledge of their chosen calling. An excellent practice, followed by some firms, is to post advertisements of reliable schools on their bulletin boards. In recommending the type of school or nature of studies to be pursued, unless the person asked feels qualified to recommend intelligently, it would be better for him to refer the employee to someone better qualified. Recommending correspondence schools to men who have not had sufficient formal schooling to have learned how to study efficiently is not likely to prove good advice and may lead to discouragement, if the pupil cannot digest the instruction. By all means, local schools, if available, should be recommended. The influence of personal contact with a good instructor will do more for the pupil than any correspondence course, no matter how well conducted. It requires a great deal of will power for a young man to continue to study when there is no personal supervision of his efforts. The writer has met some brilliant men who have received training through correspondence courses, but it is his firm belief that these men finished the courses because of their ability, rather than that their ability was acquired through correspondence courses.

—PHILIP F. SHAFRAN, *Machine Shop Instructor, James Monroe High School.*

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Learning from the Small Shop

THERE is a tendency to order special tools without considering fully the possibilities of using standard equipment. This is especially true with large concerns who are in the habit of ordering special tools and to whom the cost of such a tool may not look large.

The cost of special tools is justified when the work cannot be done without them, or when the tools will pay for themselves by decreasing manufacturing costs, due consideration being given, of course, to the number of pieces to be made and the cost of maintaining the tools.

If the shop is to be held responsible for the quality and cost of what it produces, it must be allowed to use its own methods. Nevertheless, it should welcome suggestions and information from the other departments and give acknowledgment, if the suggestion is used. A little diplomacy on the part of the shop will avoid giving offence if the suggestion is rejected.

—GEORGE FIELDING, *Mechanical Engineer, E. I. DuPont de Nemours.*

* * * *

THE : NEXT : TOPIC

"Off With the Old, On With the New"

When Do Automatic Machines Pay?

SUMMARY OF THE DISCUSSION

The estimating department made up an estimate on a quantity of interlocking devices, and found, when the overhead was added, that the cost was entirely too high. They blamed the shop. The shop asserted that the tool cost was out of proportion, and that many of the parts could be made in lengths and afterward cut off. The engineering department then declared it would not approve devices made by job shop methods. Williams retorted that the engineering department was supposed to tell the shop what to make, but not how to make it.

IT WAS agreed that the shop should be held responsible for the quality of its product without interference from the engineering department, but that the shop should, as a matter of policy, listen to suggestions.

The processes in the small shop were held to be on a par with the big shop, and its success depended upon its ability to cut corners. It was contended that economy and resourcefulness are two lessons the large shop could learn from the small one.

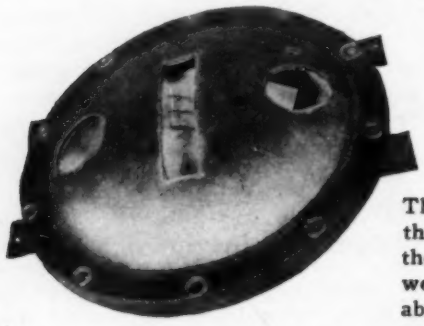
Some of the discussers thought that there was an inclination to consider the ordering of tools as a routine matter; whether they were justified by the size of the order was not always considered.

It was contended that there was a decided difference between ordering tools for definite manufacturing purposes, and ordering tools to bid on a prospective order. In the first case, the question is, what do we need? and in the latter case, what can we get along without?

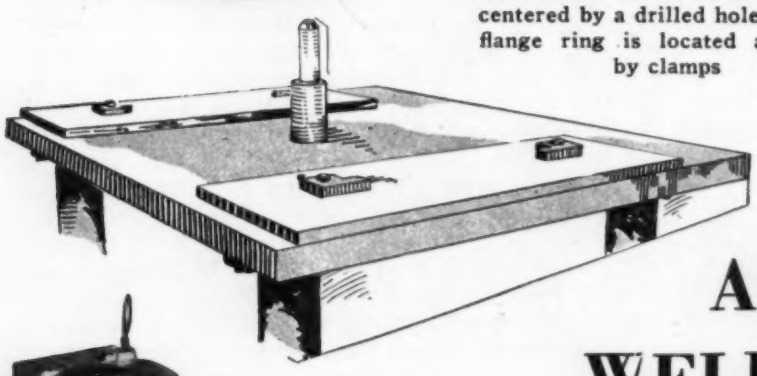
ARC-WELDED WELDING FIXTURES

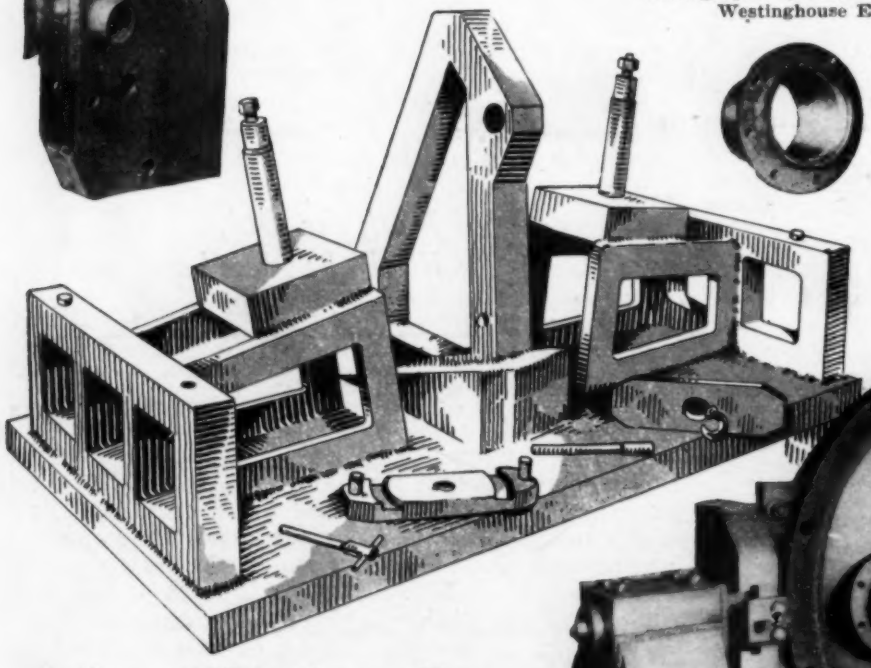
Photographs by courtesy of J. J. HUBER, Chief Tool Designer, Westinghouse Electric & Manufacturing Company

The four side lugs shown on the cover below are held for welding on the universal table below it. The cover is centered by the center hole. Center slot and side holes are cut, and holes drilled before placing on the next fixture

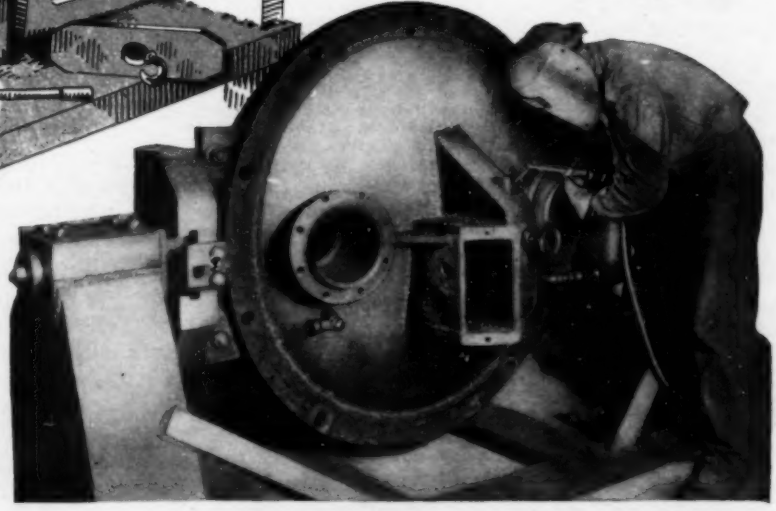


The dome plate and flange ring of the large circuit breaker cover at the right are held in position for welding on the universal, adjustable fixture above. The cover is centered by a drilled hole, and the flange ring is located and held by clamps





Gussets, vent pipes, side boxes, and the reverse side of the almost - finished cover are welded on the universal swinging fixture below



After assembling and arc welding, the flange and mechanism box above are drilled and reamed complete, then placed with the cover on the fixture shown. Accurately located pins and bored holes locate and hold all parts during welding

Fig. 1—One of the electric, lift-type trucks for transporting material and supplies from yard and storehouse to the different departments

Out of the Scrap Heap

By Frank W. Curtis

EVERY railroad that makes its own locomotive repairs has a scrap heap in which may be found old ash pans and old sheets from water tanks, together with miscellaneous old parts, scrap, and obsolete material. Boiler flues that have passed the "safe ending" stage and small pieces of sheet metal are to be found in every boiler shop.

The Southern Pacific Railroad shops at Sacramento, Calif., utilize such parts for making up containers of different types for handling and moving material within the different departments and to and from the warehouse and shops.

The thickness of the material used does not matter much, because being too heavy is a good fault in a tote box or lift-truck platform, provided sufficient power is available to handle it efficiently.

The oxy-acetylene blow torch, both as a cutting tool and a welding instrument, has so simplified the fabrication of such conveniences from scrap and obsolete material that the absence of material-handling containers in a railroad shop is no longer excusable.

In general, railroad shops are handicapped by the fact that comparatively little purchased material is delivered to them in boxes, and what few boxes are received the storeroom annexes.

At the Southern Pacific Shops, the utilization of scrap for making material receptacles has directed attention to methods of transporting the containers. Concrete

Fig. 2—A platform with extended legs made from sections of discarded boiler flues welded together

Fig. 3—Tote box with extended legs to accommodate the lift-type trucks that are used

paths have been built from the shop to the warehouse and to convenient loading points in the outdoor material storage. Next, power- and hand-elevating trucks were purchased, and definite economies were made in material handling operations.

In the "old days"—and in some places nowadays—fire and arch brick were piled at a point convenient to their use. The result was that the useful life of the brick was greatly reduced, and sometimes they spalled so badly the first time the locomotive was fired up that they were immediately marked up for renewal.

It is quite evident that the brick shown on the lift truck platform in Fig. 1 are kept in a warehouse, where they belong. The square corners and the fact that they are piled show that they are handled as they should be, not thrown on to the platform.

The platform shown in the illustration has a flooring of old boiler flues. It has an advantage over a plate construction in that it will carry any load the truck is able to handle, without sagging.

An example of the load carrying capacity of this type of truck is shown in Fig. 2 where one platform is carrying a load of 1-in. rods that are to be forged. Another platform at the extreme right is carrying a load of approximately 3 tons, assuming its load of rods to be 5 x 1 x 3 ft.

Tote boxes from the same scrap heap are shown in Fig. 3. These are used for transporting material from one department to another, and, in some cases, for bringing material from the warehouse. They are not, however, intended for material storage in the warehouse.

For departments that machine small parts in quantities, the double-decked type of portable, work unit shown in Fig. 4 was fabricated. Usually the rough parts are placed in the lower tray by the material man, and as the operation is finished they are placed in the upper tray. The entire unit is then wheeled to the next operation. These trays do not leave the department to which they are assigned.

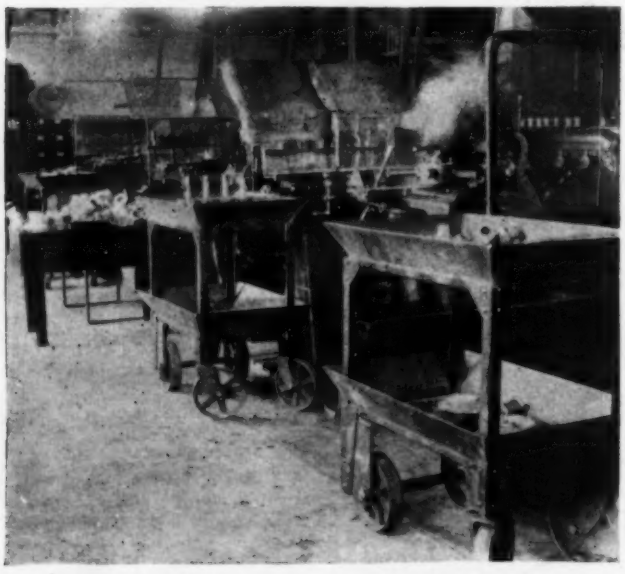


Fig. 4—Material trays with two fixed and two swivel casters. Unfinished work is carried in one tray and, after being machined, is placed in the other

Several other forms of bins and containers have been developed for storage and special purposes. Each of them has its beginning in the scrap heap.

· BOOK · REVIEWS ·

WAGE INCENTIVE METHODS. *By Charles Walter Lytle, Director of Industrial Co-operation, New York University. Four hundred fifty-seven 5¾x8½-in. pages. Cloth board covers. Indexed. Published by The Ronald Press Company, 15 East 26th St., New York, N. Y. Price $7.50.*

JUDGING by the number of inquiries for comparative information on wage payment methods this should be a timely and useful book. It brings together into one volume a wealth of data on methods of job comparison and incentive plans, dealing with the selection, installation, and operation of the latter.

In all, twenty-five wage-payment plans are described and analyzed. A hundred and forty-nine tables and charts are given to illustrate performance variations. There are twenty chapters covering such subjects as: classification, selection, applications, setting base rates, installation, multiple rates, sharing plans, incentives for supervisors, and methods of studying incentive plans. The chapters are subject paragraphed for each reference.

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FORTY YEARS WITH GENERAL ELECTRIC. *By John T. Broderick. Two hundred eighteen pages, 5x7 in. Published by the Fort Orange Press, Albany, N. Y. Price $2.50.*

THIS book, one part of which deals with the history and progress of the General Electric company, and another part with personal reminiscenses of the author's long connection with it, will naturally appeal most to the multitude of people who are, or have been in the past, connected with the General Electric company in some manner. Aside from these people, however, it is of interest to engineers and teachers because of the intimate portrayal of Whitney, Langmuir, Coolidge, and others who have added to the engineering reputation of the company. As might be expected, several chapters deal with the personality and work of Steinmetz, and give an intimate picture of him at work and at play.

Students of management will find it interesting for its brief description of the way a vast organization has expanded efficiently and consistently without using spectacular methods or management experts.

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REPRESENTATIVE INTERNATIONAL CARTELS, COMBINES, AND TRUSTS. This paper-bound booklet consists of 76, 9x6-in. pages. It contains a survey of six of the leading European international cartels and combines, the international rayon, aluminum, steel, and potash cartels, and the margarine and match combines. In addition, the bulletin carries a complete list of international cartels and a selected bibliography on them. The booklet is particularly timely in view of the fact that there have been so many of these movements within the past few years. It can be obtained from the U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C., or from the Superintendent of Documents, Government Printing Office, for 15 cents.

The Flaming Sawblade

By F. E. ROGERS

Applied Engineering Department,
Air Reduction Sales Company

OXYGEN cutting of steel, wrought iron, and cast iron is a process of burning the ferrous metal along a predetermined path with a stream or jet of oxygen. Only the red-hot metal in the path of the oxygen jet burns; the cooler metal immediately adjacent is unburned and practically unaffected beyond narrow zones on each side of the cut. Inasmuch as cutting or burning is confined to a narrow kerf, no matter what the depth may be, it is apparent that gas cutting can be compared to metal sawing, the "saw" being a jet of oxygen instead of a metal disk or blade.

In order to start the cut, the metal must be preheated at the starting point to a bright red. Acetylene is a desirable gas for this purpose, considering the time required to start the cut and the oxygen consumption. Heating for cutting is accomplished with a small flame or flames close to a central orifice in the torch top through which the oxygen cutting stream issues. The number of these flames varies from one to six, seldom more. One flame is rarely or never used, and seldom are more than four or five required, except when cutting cast iron. Four or five preheating flames assure that one or two flames are ahead of the oxygen jet when cutting in any direction parallel to the surface of the piece cut.

Oxyacetylene cutting was practiced at first with hand torches exclusively, and the hand torch is still the principal cutting tool. As in other hand operations, accuracy, smoothness, and cutting efficiency depend upon the operator.

One of the first efforts to remove the limitations of hand cutting was the application of a pair of small wheels on an axle which supported the torch at the proper height and side angle. This device, never very popular in this country, is used extensively abroad in making cuts in large plates, particularly in shipyards.

Straight-line cutting machines were developed early in the present century. They comprise a vertical frame with supports, a horizontal slideway or track, a slide to which a torch is fixed adjustably fitting the track, and a crank-driven screw to operate the slide. The torch is thus propelled across the work, carried at the proper height and angle for cutting. This method of cutting requires the operator's constant attention for the slide, with a consequent lack of care of the torch, and the cutting speed cannot be controlled accurately.

Motor-driven cutting machines, with regard to the work they do, are in three general classes: portable, semi-portable, and stationary. The degree of portability of the machine used in any field depends, of course, upon the comparative costs of bringing the work to the machine, and bringing the machine to the work.

The radiograph is a portable machine weighing about 120 lb. and carrying a straight-head machine torch with means for setting the torch at any angle for beveling or calking an edge. A compound slide rest provides for vertical and horizontal adjustments. The carriage is on three small wheels, two of them tractor wheels. When cutting to straight lines, the wheels run on a grooved track; when cutting in circular arcs or circles, they revolve around a pivot point of a radius rod. This machine is useful for fabricating any shape bounded by straight lines, circles, or a combination of the two.

A semi-portable machine, weighing about 150 lb. guided by a track or radius bar, and utilizing unusual methods for guiding the cutting torch, the camograph carries a torch mounted on a vertical slide at the outer end of a double hinged arm. The hinged arm is supported by a vertical post fixed in a U-shaped base. At the top of the post is a cam holder which holds in a horizontal position an internal cam, that is, a plate having an opening, the shape of which is approximately the shape to be cut. Contacting with this surface is a magnetic roller driven by a variable-speed motor. As the roller turns on its axis, it follows the cam shape and carries the torch with it, cutting the shape below. This is a repetitive production machine, since only one shape can be cut with a given cam. Boiler hand-holes, hand-hole covers, dies, tube supports, and similar pieces are cut with this machine.

The oxygraph, primarily hand guided, is a machine which may be adapted to templet, radius bar, or cam control if desired. A square bar in front, mounted on a pantograph assembly, carries a torch, or torches, and a motor-driven tractor device steered by hand-twisting of the vertical sleeve above the tractor or tracing wheel. The tracing wheel can be made to follow the lines of a drawing laid on the table, the torch or torches cutting out duplicate shapes. Small shapes from piles of thin plates can be cut successfully if they are clamped to protect them from buckling.

Machine cutting of shapes requires little power for operation. In addition, no tools, dies, or shears are necessary. In some cases, parts may be used without machine finish. Costs of cutting depend on the thickness and quality of the cut required. If the most economical cuts are wanted, the speed is set at the highest rate that can be maintained without interruption. The drag may then result in some deformation of the lower side shape, particularly if the direction of cut changes suddenly. If the cut shapes are to be used without subsequent finishing, the cutting speed is reduced so that the drag is not more than 0.1 in. on ½-in. stock to 0.25 in. on 2-in. stock.

A common empirical rule for measuring the efficiency of oxygen consumed is by comparison of the number of cubic feet used with the area of the cut surface, measured on one side of the kerf only. Economical machine cutting of ½-in. plate is realized when 8 sq.in. of cut surface are produced by one cu.ft. of gas. This means that about 16 in. of plate are cut. If the plate thickness were 4 in., the factor becomes about 5, that is, about a 1¼-in. cut would be made by one cubic foot.

Abstract of a paper entitled "Cutting Steel Shapes with Oxyacetylene Torch Machines" presented at the joint meeting of the Metropolitan sections, A.W.S. and A.S.M.E., New York, January 7.

IDEAS FROM PRACTICAL MEN

The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

Press Tools for Ammeter Covers

By CHARLES H. WILLEY
Asst. Plant Supt., Hoyt Electrical Works

ONE-PIECE covers for dash ammeters, with beaded and flanged tops, are produced in quantity by the press tools shown in the illustrations.

The result of the first operation, that of blanking and drawing, is shown at *A*, Fig. 1, the work being done by the press tools illustrated in Fig. 2. The stock used is 0.020-in., soft brass in strips 2½ in. wide. The blanking, including the first drawing, is done at the rate of 1,500 per hour, the stock being stripped by a half-circle stripper on the lower die. It is necessary to keep this die sharp and clean cutting so that the covers will be evenly drawn. Also, the pressure on the drawing ring must be evenly balanced and the stock lightly greased.

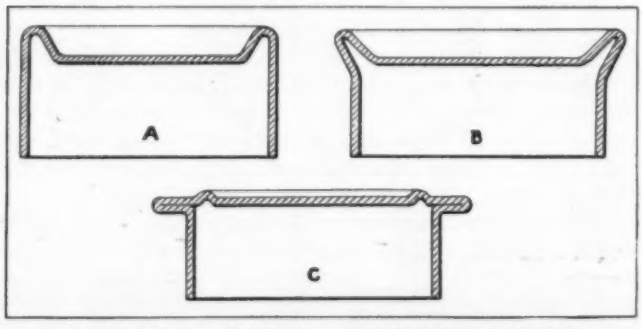


Fig. 1—Stages of drawing and forming operations

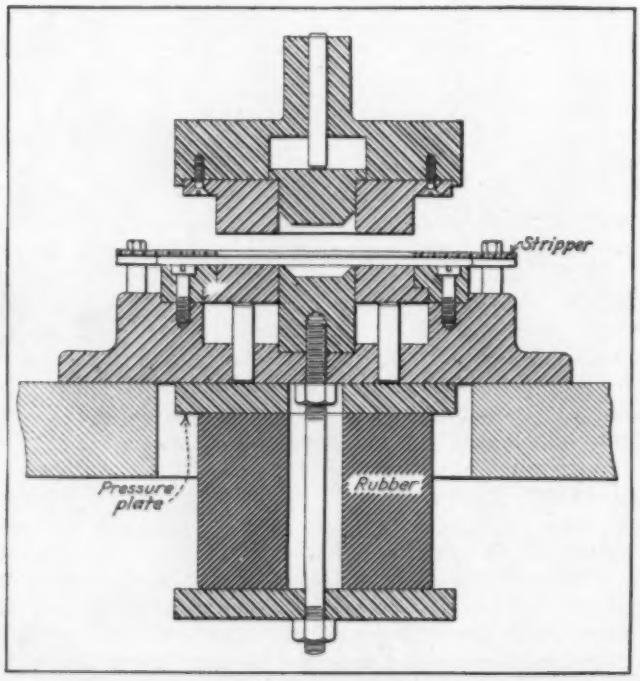


Fig. 2—Tools for blanking and first drawing

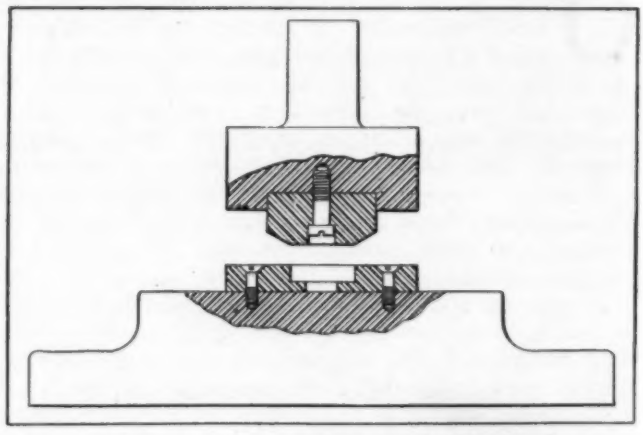


Fig. 3—Tools for forming angle of flange

The next operation, as shown at *B*, Fig. 1, required much experimenting to get the correct angle for forming the flange on account of the spring of the stock. The tools for this operation are shown in Fig. 3. They are very simple, consisting of a ring of proper diameter and depth to hold the covers, and a punch.

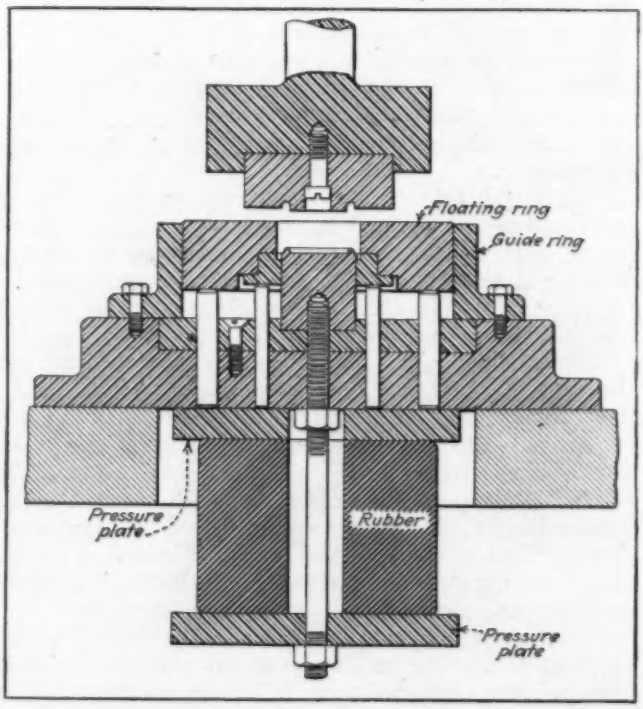


Fig. 4—Tools for folding beading, and forming flange

The last forming operation, *C*, Fig. 1, folds over the double thickness of the stock, squeezes it out to the cor-

rect diameter, and forms the bead. For this operation, we spent many dollars in making tools to stand up under the smashing 40-ton blows required to bring the flange to the correct diameter.

The center of the top is cut out by simple tools, and the ears, or lugs, are formed by tools described in an earlier issue of *American Machinist*.

A Slitting Die—*Discussion*

By C. A. Coppack
Leicester, England

While the article by Ernest Foldvary, under the title given above, on page 560, Vol. 71, of the *American Machinist*, is very interesting in theory, I would like to know what happens in practice.

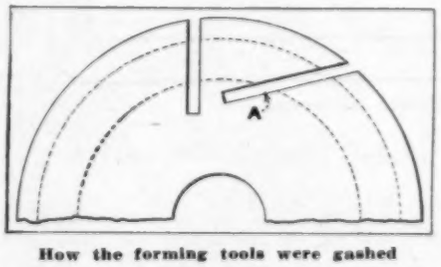
The angles of the sheared sides of the work are not mentioned, but from the sketch one might assume that they are 60 deg. from the horizontal. If such is the case, the punch has to travel twice as far through the sides as through the top and the flange in order to shear the metal. If the metal is $\frac{1}{16}$ in. thick, then the punch will have to travel $\frac{1}{8}$ in. to shear the sloping sides. What happens to the top and the flange in the meantime? They cannot move until the sides have been sheared, consequently buckling must take place. Perhaps this does not matter, but it would be interesting to know what does actually happen.

Gashing Circular Forming-Tools

By Fred H. Schofield

In making circular forming-tools, it is generally the practice to harden and grind them to shape before gashing them. Gashing forming tools after they have been hardened is a slow, expensive operation, and it can not well be expedited. No matter how carefully the job is done, the tool will heat up, and there is always danger of drawing the temper.

It has been my practice to make two saw cuts in such tools after they have been turned to shape, and before they are hardened. The illustration



How the forming tools were gashed

shows the location of the cuts. After the tools have been hardened, tempered, and ground, the angular pieces between the saw cuts are broken away by driving a wedge into the cut *A*. If $\frac{3}{16}$ in. of metal is left between the ends of the saw cuts, it will be sufficient to hold the angular pieces in place while the grinding is being done.

Colored Inks for Drawing Clarity

By Morton Schwam
Design Draftsman

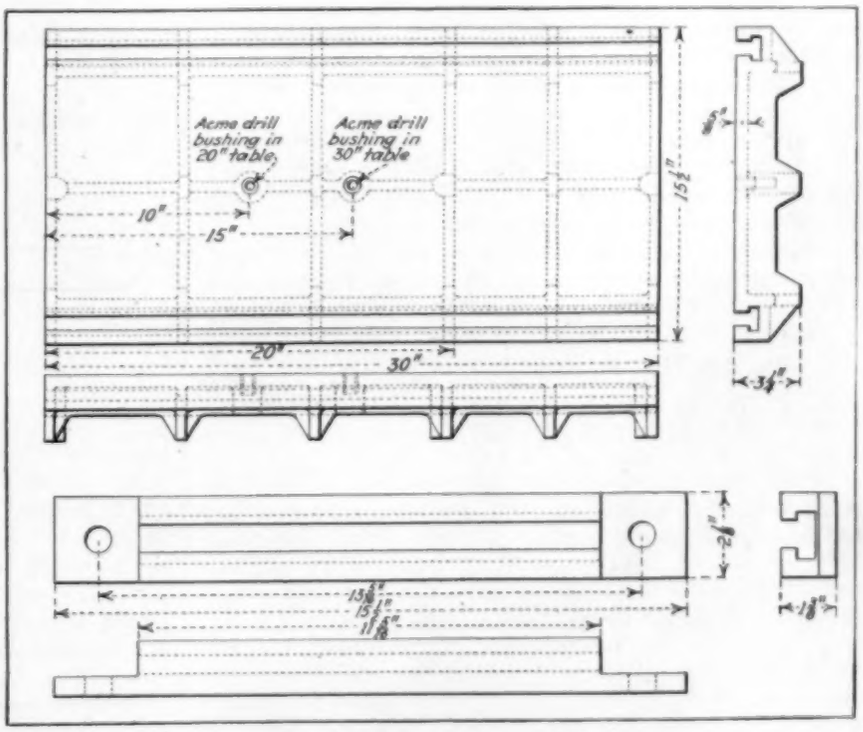
Drawings can be made very clear and distinct by the discriminating use of colored inks. In the ordinary method of using black ink for the entire drawing, dimensions, dimension lines, and center lines, there is often confusion between the part detail and the dimension lines. This may be overcome by using black ink for the detail itself, red ink for the dimensions, green ink for the dimension lines, and light blue for the center lines. In a tracing made in this manner, the detail outline will predominate over the other lines of the tracing not pertaining to the part detail. Blueprints made from such a tracing have the same features, the black ink predominating and producing a clear white line, while the colored inks produce lighter lines varying in intensity according to color.

False Tops for Drill-Press Tables

By D. D. Vandercook
Vandercook & Sons

When jigs having feet are used on a drill press, a table with a smooth top is necessary to prevent the feet from dropping into the holes in the regular table. A false top that has a smooth surface and is fitted with T-slots at the sides and equipped with three clamping bars is shown in the illustration. The clear space under the drill spindle has no projections, slots or tapped holes to catch the feet of jigs or to hold the chips. A jig can be clamped in any location by means of the usual clamps, the bolts for which can be placed either in the T-slots at the sides of the false top or in those in the clamping bars.

We use three false tops of this type in our shop, two 20 in. and one 30 in. and have found them very useful.



False top for a drill-press table

Recently we had to drill a series of holes in some long bars of cold-rolled steel, placing them on top of the clamping bars. As cutting compound was used, the chips were very messy and would have been hard to clean off of the ordinary table every time the work was shifted for drilling the next hole. With the work on top of the clamping bars, however, it was necessary only to clean off the chips from the tops each time the work was shifted.

Making Tumbling Barrels Do Double Duty

By Chester H. Franklin

It isn't always the big ideas that save the most money. Frequently a simple notion that costs very little to apply proves capable of making substantial savings.

An example of this is seen in the accompanying illustration. The back end of the tumbling barrel shaft is

Using Tumbling Barrel Shaft to Agitate Washing Basket

made to do duty as an agitator for washing parts before or after tumbling.

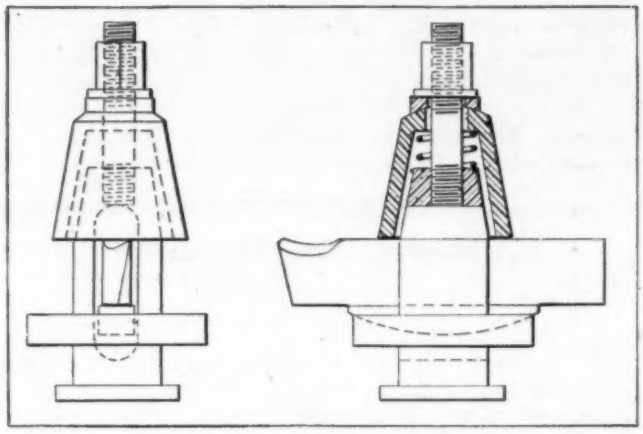
A collar that fits the back end of the tumbling barrel shaft carries a stud that serves as a crankpin. On the end of this is a piece of bar steel, bent to fit easily around the stud, and with a hook on the other end. With the bar held in place to prevent end movement, and a basket of wire mesh hung on the hook, any work in the basket is thoroughly washed by the up and down movement in the hot water, or solution, in the tank.

An Improved Tool Clamp

By Joseph Villiger
Borden Company

In the illustration is shown a tool held in an improved lathe toolpost provided with the familiar dished washer and pad for adjusting height of the tool point. Instead, however, of the usual toolpost screw with its single-point bearing on the tool, a conical sleeve, placed over the toolpost, is tightened on the tool by a nut on a stud screwed in the hole for the regular toolpost screw. It will be seen that the sleeve provides a two-point bearing on the tool, holding it more firmly than would the usual screw.

The skirt of the sleeve is large enough inside to clear



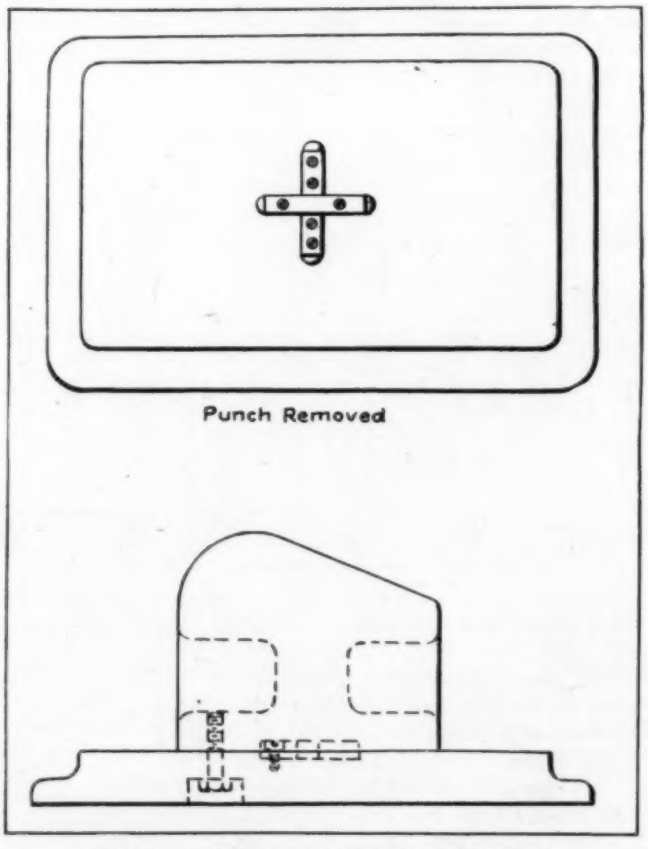
An improved clamp for lathe tools

the toolpost when the tool point is raised, or depressed, to the fullest extent necessary. The top of the sleeve is spherical in shape with a dished washer between it and the nut to compensate for the swiveling action in the adjustment of the tool. A spring under the top of the sleeve, bearing on top of the toolpost, raises the sleeve from the tool when the nut is slackened.

Cross-Keys for Holding Heavy Punches

By Ernest Foldvary

On large, heavy press tools, punch-holder plates and punches are normally attached to dies by dowel pins. Sometimes dowel pins are not strong enough to prevent the punches from shifting sidewise, or endwise, unless four or five heavy pins are used, and at times not then.



Method of attaching punches and punch holders

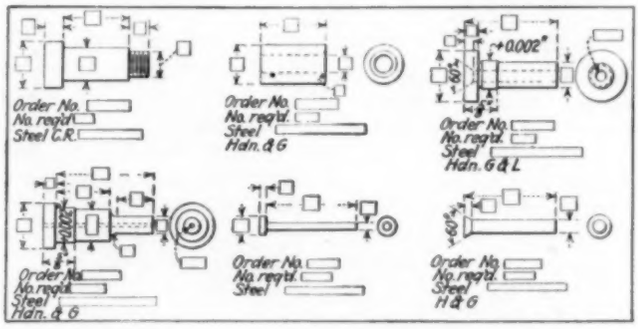
The illustration shows a simple and more positive method of attaching punches and preventing them from shifting. The cross-keys are screwed to a snug fit in grooves of the punch-holder plate, the punch having similar grooves. This method has been used satisfactorily. Strange as it may seem, assembling and disassembling of dies is greatly facilitated.

Ready-Made Sketches for the Toolroom

By C. W. Hinman

Chief Tool Designer, Kobzy Tool Company

Where work of like shapes but different sizes is frequently to be made, such as parts of punches and dies and the clamping devices of jigs and fixtures, it is a distinct saving to make a drawing and several blueprints of the parts, containing dimension lines but no dimensions. On the tracings there should be black spaces



Blueprint with blank spaces for dimensions

between the dimension lines and opposite any notations necessary, so that they will show white on the blueprints, as shown in the illustration. Pencil marks in these white spaces will be more legible than if made on the blue background of the print.

The foreman should have a number of such prints at hand, and when he gives out a job, he has only to fill in the dimensions and other notations on one of the prints and hand it to the workman with the order. The prints can be cut up into separate items at the dividing lines, so that the workman need be given only a print of the part he is to make.

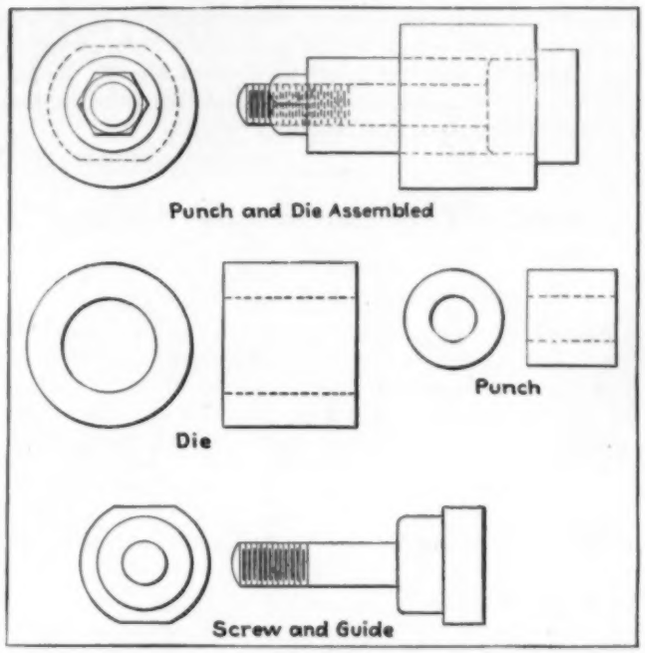
We are using this method and like it so well that we shall try to extend it to as many kinds of our work as possible.

A Hand-Operated Screw Punch

By P. H. White

The ordinary screw punch for sheet-metal work, made in the form of a C-clamp, is limited in its use to a very short distance from the edge of the sheet because of the necessarily small depth of throat opening. For work in light sheet metal, the hand-operated punch shown in the illustration has the advantage of being applicable to any part of the sheet. The device consists of four parts: a die, a punch, a screw, and a nut. The screw has a shoulder under the head, which is a close fit in the lower part of the die. The punch is hollow and is a close sliding fit on the body of the screw.

The hole to be punched is located in the sheet, and is



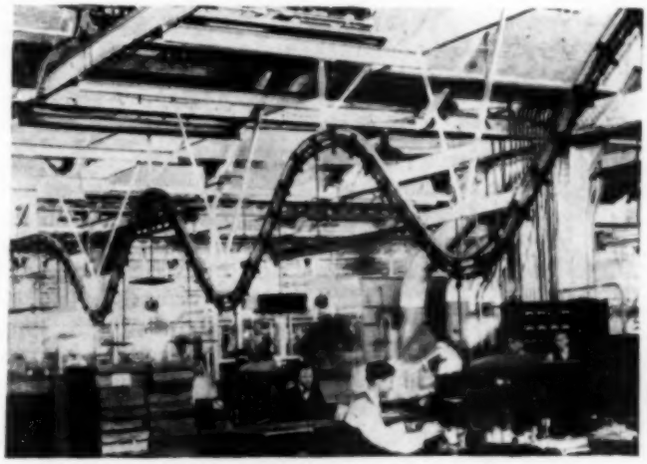
Details of the punch

scribed with a pair of dividers. A rough hole, large enough for the screw to pass through, is then cut in the sheet with a cold chisel. The die, with the screw in place, is then placed on the under side of the sheet, and the screw is passed through the rough hole. The punch is then placed on the screw and is centrally located by means of the scribed circle. Screwing down on the nut forces the punch through the sheet, leaving a clean hole. The head of the screw is flattened on two opposite sides to provide hold for a wrench, or for a vise.

A punch of this type is, of course, limited to punching holes of comparatively large size. The power required for punching may be lessened by giving the cutting edge of the punch a slight shear.

A Dip-The-Dip Conveyor

Power packs of radio receiving sets are delivered to the 752 inspectors at the new Atwater Kent factory in Philadelphia by means of the dip-the-dip conveyor illustrated. Following inspection, the packs are carried into the assembling departments by the same means.



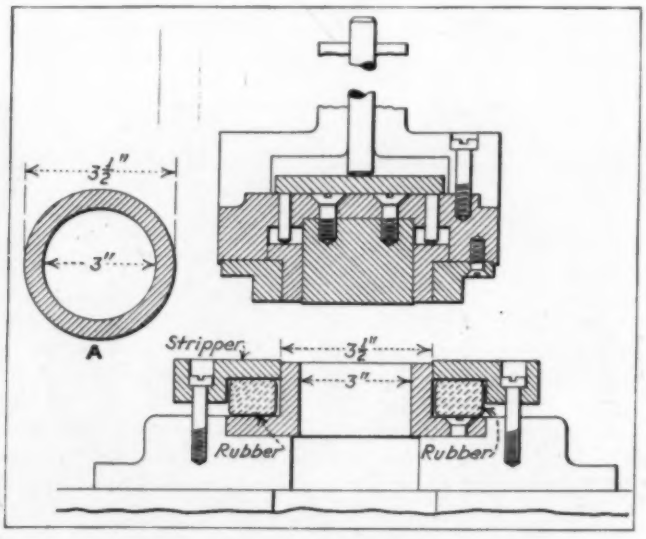
A dip-the-dip conveyor at the Atwater-Kent factory

Similar dips in a conveyor may be made to serve two distinct purposes, one to clear aisles, machines, and similar obstructions which would interfere with a straight-line conveyor, and the other to allow a slightly longer time between stations at some point of the conveyor line without making special allowances.

Rubber Used for Stripper Springs

By Charles H. Willey
Asst. Plant Supt., Hoyt Electrical Works

In making a large quantity of rings from $\frac{1}{32}$-in. hard brass, such as the one shown in *A*, the problem of stripping the stock from the lower die was solved by making the stripper as shown in the illustration and using rubber instead of springs for operating it. This method was



Die with rubber stripper-spring

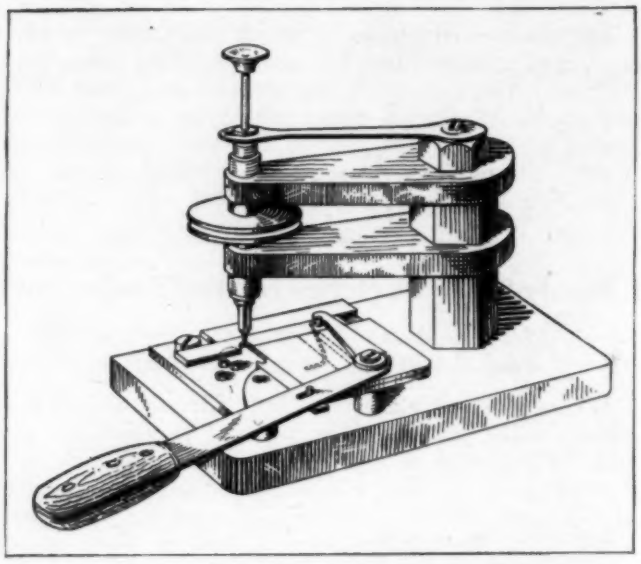
adopted because we could not operate from below with the usual pressure pad on account of having to let the 3-in. blank fall through the die and bolster.

The stripper was made in the form of a flanged ring, on which was placed a ring of soft rubber, as shown. It did the work satisfactorily and we were able to produce the brass rings at the rate of 1,200 per hour. We have blanked 30,000 rings and the rubber is still in good condition.

Assembling Small Screws and Nuts

By Charles H. Willey
Asst. Plant Supt., Hoyt Electrical Works

We speeded up the assembly of small screws and nuts, used as jewel bearings for pivots, by the use of the fixture shown. The screws are headless, 0.080 in. in diameter. A hollow, revolving spindle acts as a magazine for the screws, holding about 50 at one time. The lower end of the spindle is split like a collet, providing enough tension for gripping the screws while they are being screwed into the nuts. Depressing a ramrod, the upper end of which has a dished button to fit the finger, lowers the spindle and feeds the screws through it. Two ramrods are used, a short one when the spindle is full, and a long one when it is about half full.



Fixtures for assembling small screws and nuts

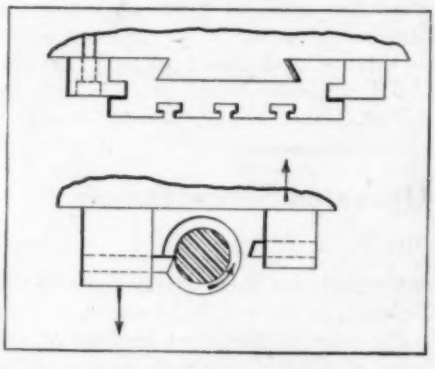
The nuts are laid on the table of the fixture and are carried and held under the spindle by a slide, the nuts being fed to it by hand. With a nut in place, the operator pushes down on the ramrod until the screw is started into the nut, when it will feed itself farther into the nut and out of the spindle. After the screw and the nut have been assembled, and the pressure has been released from the ramrod, the spindle is raised by a flat spring at the top, allowing free withdrawal of the assembly.

Moving the slide forward by the toe of the lever carries the assembly over a hole in the bed, through which it drops into a receptacle below. Upon the reverse action of the lever, the slide feeds and holds another nut under the spindle.

Production Turning on an Engine Lathe

By Ernest Foldvary

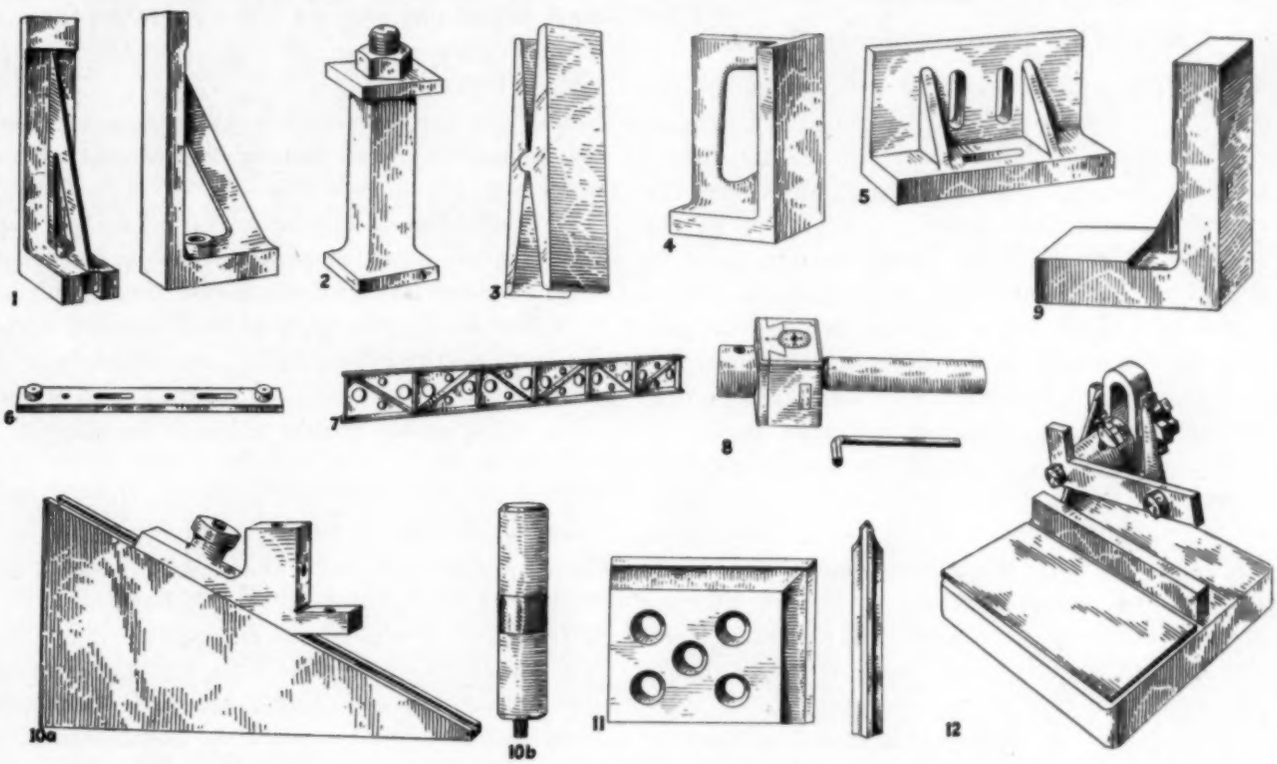
When an engine lathe is used for production work, especially where the straight-in feed method is employed, two toolblocks are generally used, one at the front and one at the rear. When the tools in the rear toolblock are cutting, the tendency for that toolblock is to lift up, resulting in chattering. When chattering takes place, not only does the quality of the work suffer but the tool has to be ground more frequently. In the illustration is shown an arrangement that has been used to eliminate such trouble. Grooves are cut in the sides of the base to which the toolblocks are attached, and two hold-down strips, or gibs, are screwed down to the carriage, as shown. With the base for the toolblocks so held to the carriage, the chattering will be eliminated, resulting in better finish and faster production.



Hold-downs for toolblocks

Toolroom Conveniences

Commercial measuring irons, angles, and miscellaneous equipment



MISCELLANEOUS equipment in wide variety is available commercially for the toolmaker. Such a great selection may be obtained, in fact, that it is possible to show on this page but a few reproductions of the products of particular manufacturers. They are, however, typical of the sort of equipment obtainable.

The precision measuring irons in Fig. 1 are useful in measuring, laying out, and clamping. A key slot is provided. They are of close-grained cast iron, in two sizes, 2½x6x12-in. and 4x8x21-in., normalized and ground. The universal right-angle iron shown in Fig. 4 is of similar material and similarly used. It may be used also as a height block. Four sizes are available. The cast, slotted, angle plate in Fig. 5 may be used on any machine for the same purposes as the others. Ten sizes of this seasoned and ground plate are made. The toolmaker's knee in Fig. 9 is somewhat similar, being used for holding small work while laying out, grinding, or inspecting, often with a magnetic chuck. Two sizes of this seasoned and ground casting are obtainable.

Bolts of planer jacks similar to the one shown in Fig. 2 may be removed, converting the body into a solid block for packing on a wide variety of machines. They are made in five sizes, from 2 to 6 in. in height.

Designed for holding irregular or tapered parts in a machine vise, the hardened tool-steel equalizing jaws in Fig. 3 have ground faces and come in several sizes. The boring-tool holder in Fig. 8 is adapted for quick and accurate boring of small parts. The smallest diameter of the adjustable head proper is 2¾ in., and the length is 6⅞ in. over all.

The sine bar in Fig. 6 is not as well known as it should be. It is used in measuring angles, laying out, and in testing, and presents a rapid and accurate means of checking. It is available either 5 or 10 in. in length. It may be used with the sine-bar holder or fixture, Fig. 12, which acts as an accurate base for an attached sine bar. The pivot-measuring stud and clamping arrangement may be adjusted independently.

In Fig. 7 is shown a straight-edge, available in four sizes, from 36 to 72 in. in length, used in inspecting alignment and bearing surfaces of machine tools and fixtures, or in scraping. The edges are ground parallel.

A planer and shaper gage is shown in Fig. 10. The gage, 10*a*, may be set from 8½ to ¼ in. in height, when used with its extension, 10*b*. It is used for adjusting cutting tools, by setting it to a micrometer, surface gage, or caliper, and referring it to the tool.

In Fig. 11 is shown a tool-steel precision hand square. This one is hardened and ground to an exactness which enables detection of errors less than 0.0001 in. in a length of 3 in. The edges are beveled on both sides as shown, giving practically a line contact with the work, while the base is ground wide and square to give a stable support on a surface plate.

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Use of Old Measurements Persists

THOSE who believe that enforcement of the use of a new system of weights and measures can be readily accomplished in the United States by the passage of a law are not familiar with the experience of other countries. Advocates of the forcible adoption of the metric system point to the large list of countries in which it is the official standard. They do not tell us, perhaps because they do not know, of the difficulties encountered, or that it seldom really becomes standard practice. Its use is not universal, even in France itself.

Japan has been cited many times as an excellent example of the ease with which the metric system could be adopted. But is it? Even in the machine building industries, which are comparatively new in Japan, and in spite of the early French influence in supplying the first machine tools to that country, the English inch is much more common in the Japanese shop than the millimeter.

Strong pressure is being brought to bear by governmental departments to enforce the use of metric measurements. As a result we find some shops in which the bulk of the machines are built by English measurement, while the others are built to metric dimensions. The confusion is serious. In the shops doing considerable governmental work the tendency of course is to shift all work to a single standard, the transition period being filled with the difficulties that always accompany such a change. Other shops are apparently sticking to the English inch, and there seems to be little inclination to change.

The tendency to cling to old units is indicated by the official reports of land units and of volume. The governmental report on rice, for example, uses "kokus," a unit equaling 5.12 bushels, while "tsubo" remains the land unit as of old. The government railway time table still gives distances in miles, and the gage of the railway is always quoted in feet and inches.

The great problem in all countries remains: Is the change worth while? If so the manufacturers will eventually adopt it without compulsion.

Outwitting the Business Cycle

AT LEAST one school of economic thought has borrowed and adopted the law of physics that there is an equal and opposite reaction to every action. What goes up must come down; what swings sidewise must swing othersidewise; prosperity must be followed by adversity. As night followeth day, a period of bad business must follow one of good. It has always been so; it must always be so. To question the business cycle is heresy indeed.

But why not question it? Why lay oneself and one's business down before the wheels of this cyclic juggernaut when it can be side-stepped? The business cycle can be outwitted by the exercise of good, sound, business strategy, backed by ingenuity and hard work. Grant the established fact that business in general does move in cycles, it should also be granted that a business in particular can be, and has been, so managed as to operate with satisfactory returns during the dullest of dull times.

For example, the M Company found itself caught with high inventories and diminished sales during the depression in 1921. The research staff of the M Company pointed out to the sales department that it had never entered the Pacific Coast market. The sales department put on special advertising campaigns, retained extra salesmen, captured the new market, and bolstered its total sales beyond par.

For another example, the T Company was confronted by the same depression. On analysis, its officers found that while it had been capturing and holding the automotive market to the extent of 85 per cent, it was dawdling along with a bare 3 per cent of the general industrial market. While holding its proportion of the automotive market by means of undiminished advertising and personal selling, it augmented its advertising and personal selling to the industrial market. To this day, T Company has not begun to exhaust the potentialities of the industrial market, and will not do so for years to come.

Perhaps the M Company and the T Company were particularly favored by the nature of their lines and the temper of their executives. But no company is barred from designing a new machine or tool or commodity that will make obsolete an old, and no company is barred from stepping up its vitality, its advertising effort, and its selling pressure. The business cycle can be outwitted and overcome.

SHOP EQUIPMENT NEWS

Landis Hydraulic Roll Grinders

FITTED to grind rolls either straight, concave, or convex, the Type B hydraulic roll grinder has been developed by the Landis Tool Company, Waynesboro, Pa. The machine is made in various swings such as 16, 20, 24 and 28-in., and in lengths between 8 ft. and 16 ft., in increments of 2 ft. The 20-in. machine is particularly suitable for the strip steel industry. Among the chief features of the machine are: hydraulic work carriage traversal and reversal, which gives a large range of speeds with smoothness and quietness; drive to the grinding wheel spindle through multiple V-belts; economical grinding by means of a 30-in. grinding wheel, and an accurate crowning and concaving mechanism of simple design.

Oil for the hydraulic mechanism is contained in the reservoir in the heavy box-type base. The water tank is also located in the base. A V and a flat guide support the work carriage on chilled surfaces. Machines of this type are not supplied with a swivel table unless by special arrangement, the footstock being provided with a cross adjustment for maintaining alignment. This footstock is adjustable along the entire length of the bed by means of a rack and pinion, and is provided with cross movement. A dynamically balanced, variable-speed motor drives the live spindle of the headstock through multiple V-belts and a worm and worm gear. Work speeds through a wide range are provided by means of a rheostat. If direct current is not available, a d.c. generator may be mounted at the rear of the machine and driven by a silent chain from the water pump shaft.

Wheel feed is made through a long screw and bronze half-nut. Rapid electric wheelhead cross movement is also provided.

Total inclosure and full protection from grit and water are features of the dual eccentric type crowning and concaving mechanism, which, in order to obtain the desired amount of crown or concavity, may be set and locked in position by two large easily read dials at the rear of the wheel base. Each pair of change gears may be used for a wide range of work speeds. The number of pairs required is dependent upon the variations in the length of the rolls being ground and the amount of crown or concavity. Three pairs, however, will adequately take care of any job within the range of the machine. These change gears are accessible readily. The mechanism is driven from the carriage drive mechanism, the final drive to the two eccentrics being through worms and worm gears. When grinding journals or straight face rolls, the mechanism may be quickly disengaged. A crowning and concaving diamond holder is clamped to the work table and trues the face of the wheel slightly convex so that the grinding action will not take place entirely at the edges of the wheel.

Roll carrying heads are generally of the three-bearing type, with separable and easily adjusted bearing blocks. The main drive motor is mounted on the rear of the bed with a pulley directly in line with the wheel spindle pulley, a multiple V-belt drive taking power to the grinding wheel spindle and the traverse oil pump. The oil pump shaft extends into the rear bed section where it is coupled to the water pump shaft, which extends through from the left-hand side.

The low-pressure hydraulic system includes a variable-flow oil pump and a continuous hydraulic motor. The latter, which is of the two-chamber type, is capable of being rotated any number of revolutions in one direc-

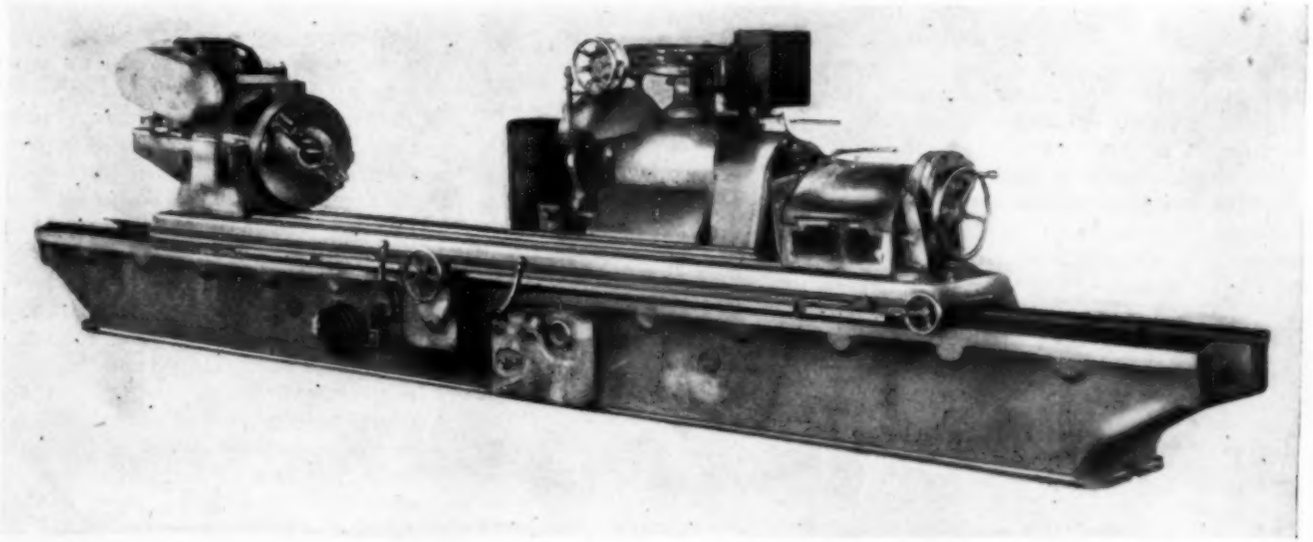


Fig. 1—Front view of the Landis Type B Hydraulic Roll Grinder, which is made in 16-, 20-, 24-, and 28-in. swings

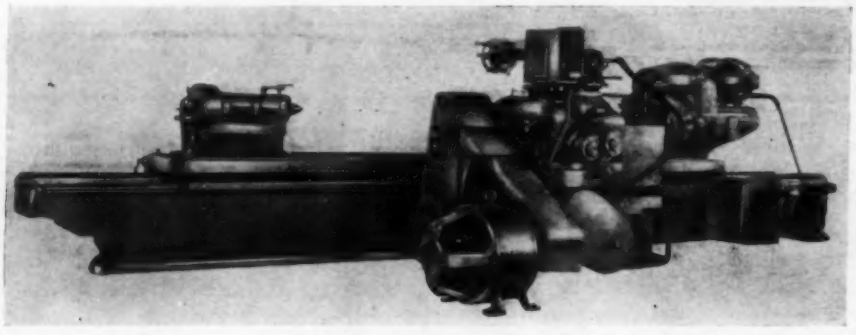


Fig. 2—Rear view of the Landis Type B Hydraulic Roll Grinder, showing the drive arrangements

tion, and then reversed and rotated any number of revolutions in the opposite direction. The speed of the work table traversal is determined by the volume of oil pumped. Both the pump and the motor are simple in design, thus minimizing the likelihood of breakdowns.

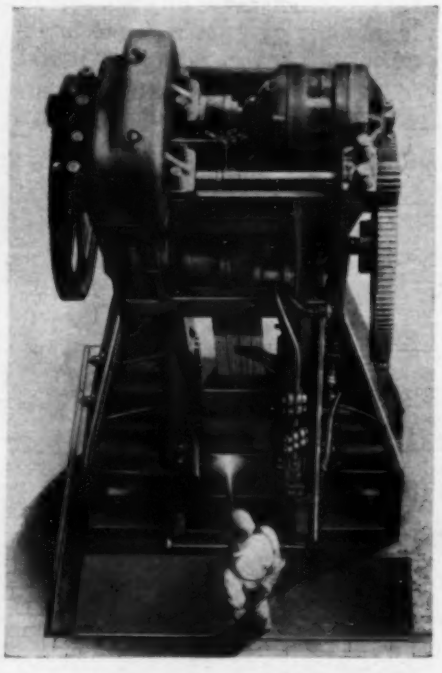
Chambersburg Motor-Driven Head for Board Drop Hammers

A MOTOR-DRIVEN head for the Model H board drop hammer has been designed by the Chambersburg Engineering Company, Chambersburg, Pa. This motor-driven head is identical with the belt-driven head, but it has a motor and driving assembly mounted on a bracket replacing the caps over the eccentric bearings. One motor only is required, and it is spring mounted and shielded from the heat of forging. Geared drive to the roll shafts permits uniform front and rear roll speeds and minimizes grinding of the boards.

The motor drives the rear roll shaft through a flexible coupling. This shaft drives the front roll drive shaft by means of a pair of balanced, forged, inclosed herringbone gears running in a spray of oil. On the rear shaft between the flexible coupling and these gears, there is a balanced flywheel protecting the motor from variations of load. It is capable of operating the hammer for several blows without power.

At the opposing ends of the front and rear drive shafts are non-metallic pinions meshing with cut steel gears on their respective roll shafts. Movement of the roll shafts is allowed for by sufficiently large centers between the drive and roll shafts. All shafts are mounted in Hyatt heavy-duty roller bearings.

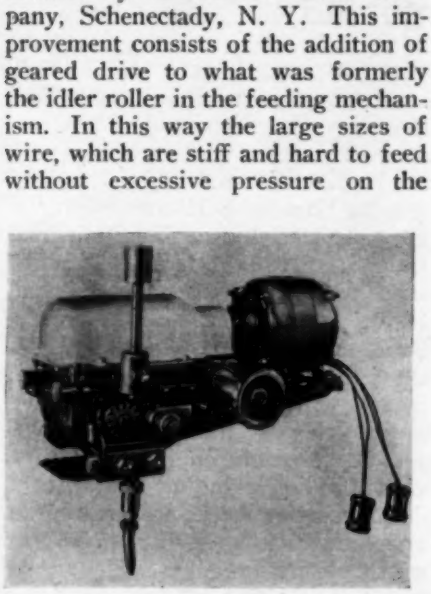
By application of power through meshed gears, loss of speed through belt slippage is eliminated. The built-in flywheel prevents the hammer slowing up under load, and the pick up is faster. Through the use of this motor-driven head the hazard from belts is entirely removed and there is no need at all for overhead staybraces.



Looking down on a Chambersburg Motor-Driven Head on the Model H Board Drop Hammer

General Electric Automatic Welding Electrode Feeding Device

An improved feeding device on its automatic welding head has been announced by the General Electric Company, Schenectady, N. Y. This improvement consists of the addition of geared drive to what was formerly the idler roller in the feeding mechanism. In this way the large sizes of wire, which are stiff and hard to feed without excessive pressure on the driving rolls, are fed positively without slippage at a regular rate, and with only a moderate pressure between the driving rolls. This improvement also permits high welding speeds and heavier welding currents, and the use of larger sizes of electrode wire.



General Electric Automatic Welding Electrode Feeding Device, which is furnished with a geared drive to the feeding mechanism

By the application of geared drive, the device may also be used for automatic welding with curved nozzles so as to reach into otherwise inaccessible places and to weld in abnormal positions. Such cases were formerly considered impractical, if not impossible, on account of the difficulty of conforming the heavier wires to any other shape than their natural curvature as they come from the reel.

The improved drive roll gears furnished will accommodate any size wire from $\frac{1}{8}$ to $\frac{1}{4}$ in. in diameter without changing gears. Below $\frac{1}{8}$ in. the gears are not needed, and it is only necessary to remove one from the drive roll shaft. Sufficient pressure can then be obtained for $\frac{1}{8}$-in. and smaller wire by screwing down the adjustment on the binding roll.

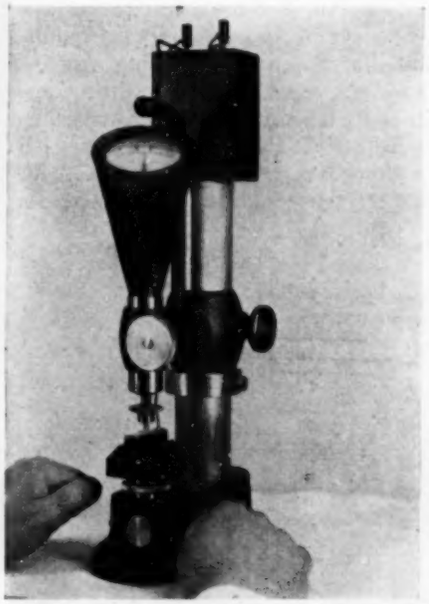
"Mikrotast" Wire Tester

Fine wire may be tested accurately and without exerting pressure upon it by means of the wire tester illustrated. This device has been placed on the market by the Coats Machine Tool Company, Inc., 110-112 West 40th St., New York, N. Y. It is of Krupp design and is imported into this country by the above agent.

The fixture is particularly useful where wire would be deformed under pressure of the micrometer screws, or where it cannot be gaged accurately because the end measuring flats of such screws are not sufficiently parallel. The supporting anvil is insulated and connected with a dry cell placed on top of the upright column. The other terminal leads to a red light bulb located directly over the "Mikrotast" scale. The instrument shown has a range of fifty 0.00005-in. divisions, equal to 0.0025 in. for the entire range.

To set the instrument, the gaging end is brought into contact with the supporting anvil so that the indicator hand stands exactly at the first graduation mark on the left-hand side of the scale. The electrical circuit is then made, and the anvil is raised by means of the micrometer screw directly below it, so that the bulb lights up when the indicator hand is exactly flush with the first scale graduation. If 0.002-in. wire were being tested, it would be necessary next to move the hand by means of the adjustment screw provided on the indicator contact spindle to the fortieth division point, forty spaces equaling 0.002 in. The wire is then placed on the anvil, held taut by hand, and pushed forward under the gaging end, the bulb lighting up when the wire is too large.

The bulb is economical in operation, taking but 40 milli-amperes. The voltage of the battery is only 3.5 volts. The electrical contact between gaging end and the anvil or wire is accurate to approximately 0.000005 in. It is also possible to use the Mikrotast indicator over a wider scale range for heavier work, or to set the gage to a master plug and add the scale range of the indicating hand.



"Mikrotast" Wire Tester for very fine wire

Taylor-Winfield Universal Four-Corner Flash Welder

BY ASSEMBLING four individual flash welders on sub-bases movable on a common base, the Taylor-Windfield Corporation, 509 Mahoning Ave., N. W., Warren, Ohio, has evolved a specialized design that may be employed for welding the four corners of square or rectangular metal frames, an example being automobile body door frames. Each machine is separate and independent of the other machines in its operation, but all units are synchronized electrically to start, flash, upset, and retract in unison. Any one or two of the separate machines may be removed from the base, leaving the other units functioning, or pairs of units may be set up for separate jobs if so desired.

The bases of these individual machines are slotted, tongued, and grooved to the sub-base so that they may be moved apart or closer together. The sub-bases are in turn tongued and grooved to the base proper and the slots in the base allow for movement of these sub-bases in either direction. As a consequence, this machine is adaptable from a small-size automobile door frame used on light cars up to the heaviest type of door frame made.

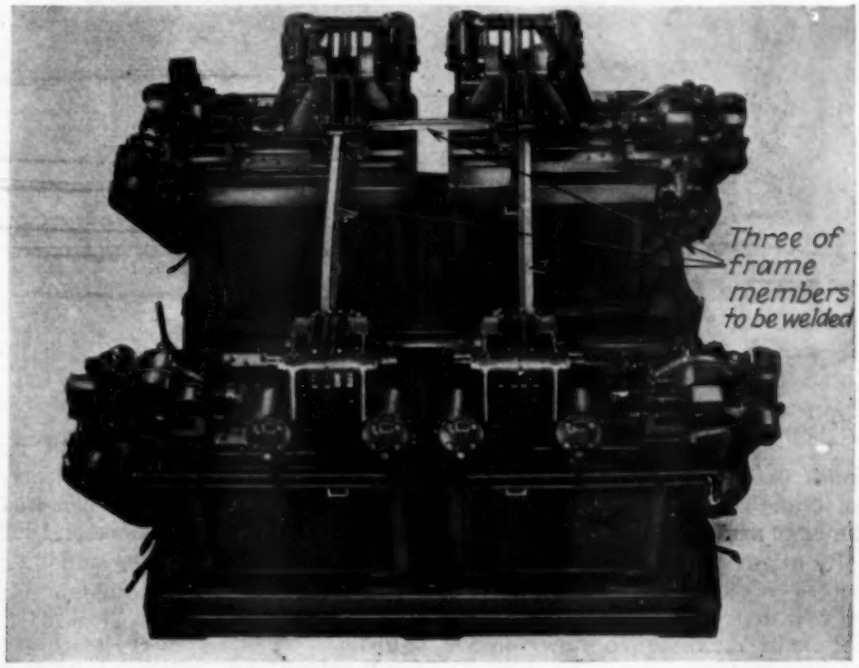


Fig. 1—Taylor-Winfield Automatic Four-Corner Flash Welder, which is suitable for joining the four members of automobile door frames at a rate of 100 to 150 assemblies per hour

Clamping of the work in each unit

is by means of air-operated clamping jaws, which apply pressure through a toggle. The jaws work in pairs and are controlled by air valve switches at the side of the machine, so that the operator's hand must be entirely removed from underneath the jaws when the clamping mechanism is energized. The dual electric switches must be interlocked from either end of the machine before the machine itself will operate. This feature necessitates the operator being out of the way while the machine is in action. Cushioned, piston-ring type air clamping cylinders are used to eliminate hammering.

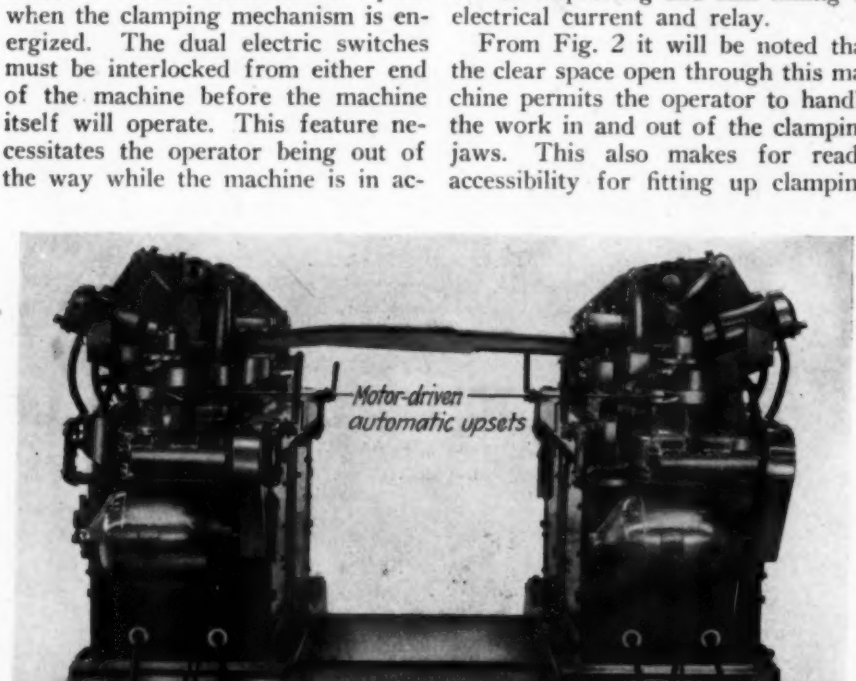


Fig. 2—Automatic upsetting units are features of the Taylor-Winfield Four-Corner Welder, the travel of these units being $\frac{7}{16}$ inch.

By means of independent heat regulators on each machine, the unit may be adjusted to weld various areas. For example, on the job shown on the machine in Fig. 1 the two corners at the front are much heavier than the other two, and, in consequence, require more welding current. The transformers themselves are of compact design and are rated at 25 kva. to provide ample power. Underneath the rear leg of the frame on the machine in Fig. 1 will be noted a dirt chute where flash is expelled.

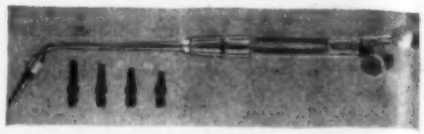
Clutches and trip mechanisms have been eliminated from the automatic upsetting units which are shown in Fig. 2, and which are motor driven. These units are of very simple construction, and the normal travel is $\frac{7}{16}$ in. but can be changed to suit the work at hand. The motor drives through a silent chain to the worm and worm gear which in turn operate the cam upsetting and cam timing of electrical current and relay.

From Fig. 2 it will be noted that the clear space open through this machine permits the operator to handle the work in and out of the clamping jaws. This also makes for ready accessibility for fitting up clamping jaws and taking care of adjustments. The clamping jaws are adjustable as to height and side elevation, and all working parts are easily accessible to the operator for cleaning, oiling, and adjustment. All wearing parts have hardened and ground tool steel slides and hardened and ground pins and brushings.

The machine is capable of a production of 100 to 150 of the automobile door frames per hour.

"Rego" Welding Torches for Airplane Production

Three torches for airplane welding work have been placed on the market by the Bastian-Blessing Company, 240-258 E. Ontario St., Chicago, Ill.



"Rego" Type SM Torch, which is designed for gas tank and sheet metal work where the same flame is used for long periods

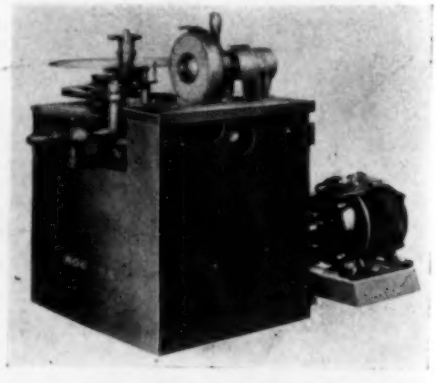
The Type SM torch illustrated is designed for gas tank and sheet-metal work where the same flame is used for hours. The torch is balanced for this class of work; and the weight is $17\frac{1}{2}$ ounces with the tip.

The Type AP torch is designed for welding such parts as fuselage, motor mounts, and tail plane assemblies. The right- and left-hand valves at the front of the handle permit the operator to change the flame with a touch of the thumb. The assembly of the torch with the light weight goose-neck gives a very light unit, the weight being about $13\frac{1}{4}$ ounces with the tip.

The Type JH torch is used for welding small fittings where an extremely delicate flame and tiny torch is needed. The weight is $6\frac{1}{2}$ ounces with the tip. Another type, the RT, is used for heavy welds such as on landing gear.

Rogers No. 4 Automatic Cross-Cut Saw Sharpener

This No. 4 automatic circular saw sharpener is designed for gumming and sharpening wood cutting, rip, and cross cut saws, and also slitting and other metal cutting saws. According to Samuel C. Rogers & Company, 191 Dutton Ave., Buffalo, N. Y., the maker, the machine is adapted for



Rogers No. 4 Automatic Circular Saw Sharpener

almost every kind of circular saw made. The unit has positive adjustments for maintaining the same degree of bevel the entire length of the grind. Circular wood-cutting or metal-cutting saws from 3 to 30 in. in diameter, with teeth from 10 points per inch up to 2¼-in. spacing, can be handled at a rate of 30 to 50 teeth per minute.

The main frame, pulleys, chucks, and other parts are of semi-steel, and the cabinet is of sheet metal. Cams and gears are hardened. The grinding wheel spindle is mounted on two deep-groove S.K.F. ball bearings mounted in dust-proof housings. The machine is full automatic in operation.

Three grinding wheels of proper grade and grain are furnished with each machine, one 6 x ⅛ in., one 6 x ¼ in., and one 6 x 5/16 in. Tight and loose pulleys can be furnished for belt drive or a ⅓-hp., single-phase, direct-connected motor for motor drive. The floor space for the belt-driven unit is 18 x 20 in., and for the motor-driven machine, 18 x 34 in. The height is 28 in. Weight, 275 pounds.

"Bath" Motor-Driven Universal Grinder

INDIVIDUAL motor drive to each of the motions is now featured in the Bath universal grinder, which has been redesigned by the Fitchburg Grinding Machine Corporation, Fitchburg, Mass. Power is now applied as close to the points required as possible, in order to eliminate unnecessary shafts and bearings. In all, four motors are used on the machine: the ¼-hp. headstock motor, the ¼-hp. motor for the water pump, the 3-hp., 1,725 r.p.m., spindle drive motor, and the ¾-hp. 1,725 r.p.m., traverse drive motor attached to the knee. The last two motors are furnished by the customer. Other improvements are: the surface attachment has been changed to give more simple and sturdy support; the traverse gearbox has been redesigned to give longer wear; and the reversing mechanism has been redesigned.

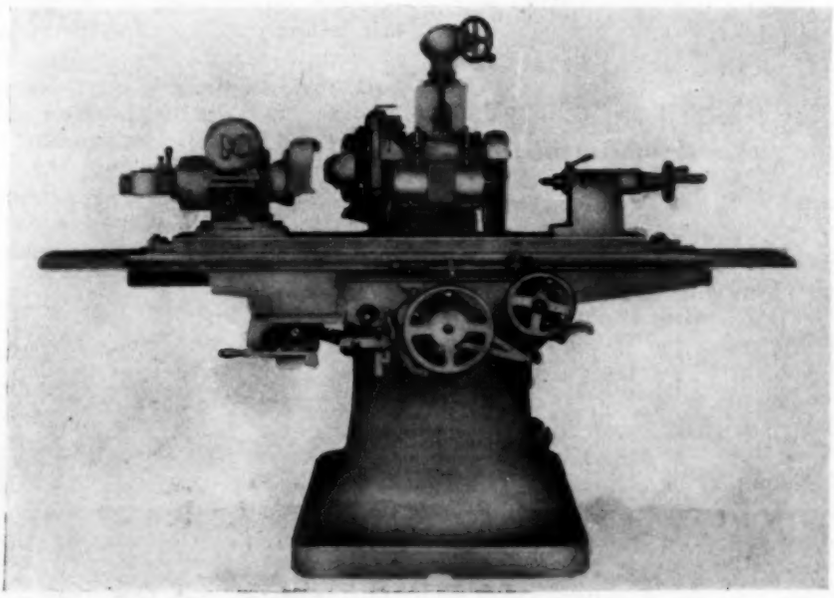
To set the machine up for surface grinding, the knee, cross-slide, and table are swiveled 90 deg. on the top of the 30-in. base, which brings the traversal of the table at right angles to the wheel spindle. A coarse automatic cross feed is furnished with this equipment, which further makes this machine a complete surface grinder.

In fitting up the machine for internal grinding, the internal arm which supports the internal spindle is clamped rigidly to the face of the column over the dovetail. The driving pulley is then screwed onto the nose of the main spindle, after which the endless canvas belt is put on over the drive pulley and the internal pulley, the spindle head being elevated to bring the canvas belt up taut.

Supported on a sturdy column, bolted to the base of the machine, the wheel head has vertical movement

SPECIFICATIONS

Size of Machine	10x25 In.	12x36 In.
Normal length of surface grinding to ± .0002 in	20	25
Maximum length of surface grinding, in	30	42
Width of surface grinding, in	9	9
Height of surface grinding under 8-in. wheel, in	7½	7½
Normal length of internal grinding, in	8	10
Swing diameter for disk grinding, in	16	18
Thickness for disk grinding, in	3¼	3¼
Range of work speeds, r.p.m	64–327	64–327
Range of table speeds, ft. per min	2–10.4	2–10.4
Size of grinding wheels, in	12x1½	12x1½
Range of spindle speeds, r.p.m.	1,850–2,800	1,850–2,800
Maximum length of power traverse, in	35	45
Weight, net, lb	4,200	4,400



Bath Motor-Driven Universal Grinder

only. The spindle is of S.A.E. steel, heat-treated, ground, and lapped. The bearings are self aligning and are adjustable for wear. Special "Sabeco" bearing metal is used. Micrometer handwheel reading to .001 in. is provided for the elevating screw.

Five speeds by means of a sliding key are obtained in the headstock drive, which is self-contained with the built-in motor. The spindle can be operated for live or dead center work, and the front bearing is adjustable. The rear bearing is Timkenized, whereas the front bearing is of Sabeco bearing metal. Final drive to the faceplate or chuck is through helical gears. The base is graduated to swivel 90 degrees.

Five traverse speeds are also available for the table through a sliding-key gearbox, which is independently motor driven. The swivel table swings

on a central stud, which is hardened and ground to fit a hardened and ground bushing in the table. A V-way in the top surface insures alignment of the head and footstocks with the two T slots. Graduations are provided on the end in tapers per foot up to 2¾ in. per ft. Clamps are furnished for setting the swivel table up to 45 degrees. When magnetic chucks are desired, a motor-generator set can be supplied in place of the traverse drive motor to furnish d.c. current for the magnetic chucks and to drive the traverse mechanism.

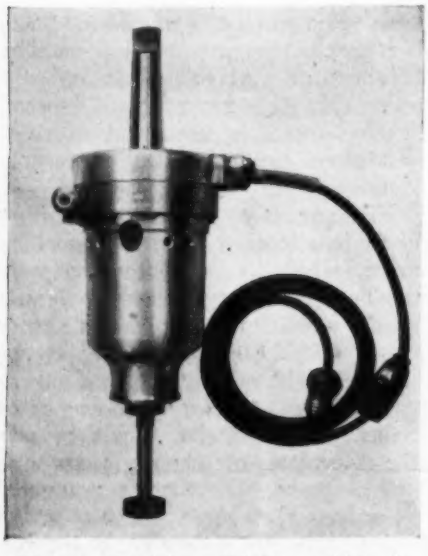
Automatic cross feeds of the table are available for a range of 0.00025 to 0.0025 in. at each reversal of the table. When the complete surface attachment is ordered, the automatic surface feed is furnished and has a range of 0.0025 to 0.025 in. at either or both table reversals.

The footstock spindle is operated by a variable-tension, spring-controlled lever. The tension is adjusted by a handwheel. Wet grinding may be done because a water tank is built into the base of the machine.

Olofson Precision Grinder

Intended for the toolroom, the precision grinder illustrated has been placed on the market by the Palmer-Edwards Company, Sales Division, Flint, Mich. The tool is manufactured by the Industrial Machine Tool Company, Fenton, Mich., for the above agent. By means of the taper shank support, the grinder can be used in any one of the standard machines, such as vertical or horizontal boring and milling machines, and drill presses. The motor case itself turns at the speed of the machine spindle and should rotate at about 60 r.p.m. By means of a graduated dial adjusting screw, shown near the top of the machine, this dial working in conjunction with an eccentric worm gear effects an offset adjustment which results in an eccentric travel of the grinding wheel. Through the use of grinding wheels of various sizes, holes from ½ to 3 in. in diameter can be ground to close limits.

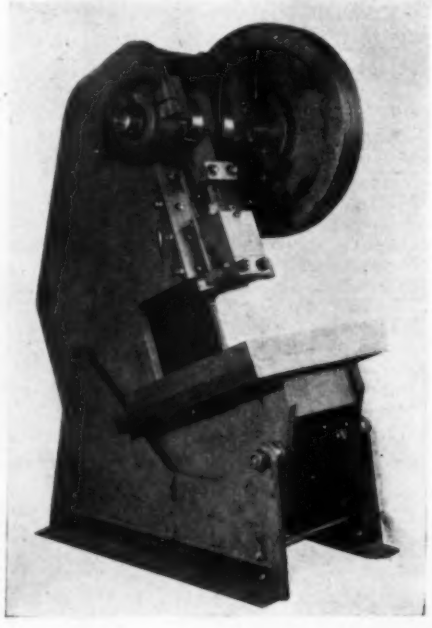
The tool is furnished with a No. 4 tapered shank and a ⅝ x 3-in. quill. Other size quills down to ¼ in. can be furnished specially. The motor supplied is of the universal type, operating on 110 to 120-volt circuits at 10,000 r.p.m. and also on 220-volt circuits at the same speed. It is rated at ¼ hp. The weight of the grinder complete is 16 pounds.



Olofson Precision Grinder, which is intended for toolroom work, and which will grind to close limits

"Verson" All-Steel Presses

FRAMES fabricated entirely of steel plates may be obtained in the line of all-steel presses manufactured by the La Salle Machine Works, Inc., 3013-17 So. La Salle St., Chicago, Ill. The steel plates are welded into units, thus permitting great strength and rigidity in the frame with less bulk. The plates are machined both before and after welding to assure alignment. Few bolts are used in the construction.

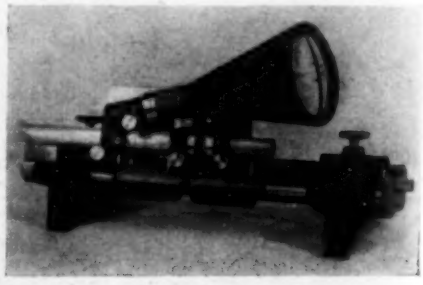


"Verson" All-Steel Press

An important feature of this line of all-steel presses is the fact that specifications may be obtained to suit the users' requirements with little or no added cost. A press exactly suitable for work requiring unusual dimensions, such as large die space, bed area, depth of throat, and other features, which would ordinarily require large and heavy presses, may be obtained.

"Mikrotast" Tap Lead Tester

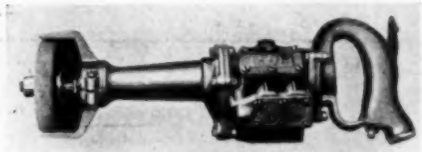
For checking the lead of taps, the test bench illustrated has been introduced into the United States by the Coats Machine Tool Company, Inc., 110-112 West 40th St., New York, N. Y. This test bench is used in connection with a special "Mikrotast" fixture, which by itself can be employed for testing the lead of thread gages. The master tap is held between centers and the Mikrotast lead testing fixture is placed in position so that the square bars at the back of the fixture square up with the slideable flats shown back of the Mikrotast indicator. The contact jaw on the right is equipped with micrometer adjustment, and the contact jaw on the left operates the indicator. By setting the hand of the indicator on the zero mark and setting the red plus and minus tolerance markers, duplicate taps can be checked easily with a master tap for inaccuracies.



"Mikrotast" Tap Lead Tester

Chicago "Little Giant" No. 10-A Pneumatic Grinder and Buffer

The No. 10-A "Little Giant" pneumatic grinding and buffing machine announced by the Chicago Pneumatic Tool Company, 6 East 44th Street, New York, N. Y., is suitable for general light work, including the smoothing of flush-head rivets. The machine is now equipped with the closed-type, pistol-grip throttle handle as shown, instead of the open type, and can

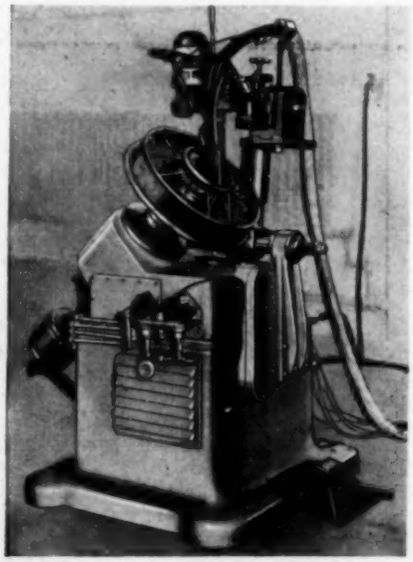


Chicago "Little Giant" No. 10-A Pneumatic Grinder and Buffer

also be furnished with the straight-type throttle handle as optional equipment. The 4 x ¾-in. wheel is driven at 4,400 r.p.m. The length overall is 16½ in., and the net weight is 8¼ pounds.

Lincoln Automatic Wire Wheel Welder

An automatic machine for the manufacture of wire wheels by the carbon arc welding process has been introduced by the Lincoln Electric Company, Coit Road & Kirby Ave., Cleveland, Ohio. The purpose of this machine is to join the pressed steel parts inside the hub as the wheel turns in a jig. The welding time for an 8-in. hub is 40 sec. and the floor-to-floor production of this size wheel is 50 units per hour.

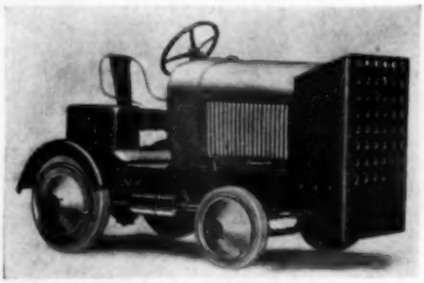


Lincoln Automatic Wire Wheel Welder

This automatic welding machine embodies the features of the "Electronic Tornado" welder, manufactured by the above company, and uses the carbon arc welding process. No metal filler rod is necessary, the metals of the hub being fused together as they rotate in the jig. A smooth, well rounded bead is produced on the hub, giving the appearance of a homogeneous steel unit.

"W & K" Gasoline-Type Industrial Tractor

An industrial tractor powered by means of a standard Ford Model AA truck motor has been placed on the market by the Whitehead & Kales Company, Detroit, Mich. This tractor is designed for all industrial hauling purposes.



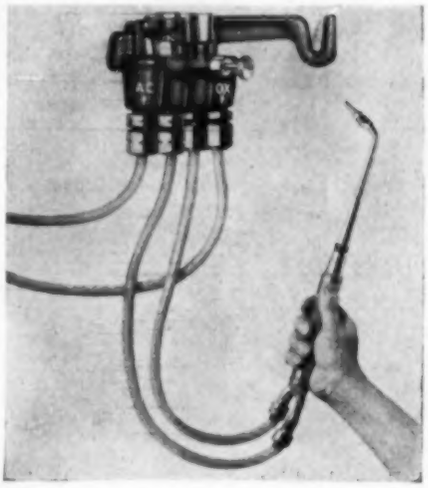
"W & K" Industrial Tractor

The "W & K" industrial tractor is spring mounted, front and rear, and is only 8 ft. in over-all length. It has a turning radius of 8 ft. All wearing parts are of the standard Ford Model AA truck type, such as the motor, 4-speed transmission, radiator, starter, steering gear.

This tractor has a drawbar pull of approximately 1,500 lb. with a speed of 19.7 m.p.h. in fourth speed at 2,000 r.p.m. Its total weight is approximately 2,450 lb. It is furnished complete with battery, coupler, radiator guard, spring seat, generator, and started. A feature is the cone-shaped, disk-type, self-deflecting wheels, on which dust-proof bearing retainer plates eliminate the use of hub caps.

Rego "Economizer" Automatic Shut-Off for Welding Gases

A shut-off for welding gases, known as the Rego "Economizer," has been placed on the market by the Bastian-Blessing Company, 240 E. Ontario St., Chicago, Ill. By the use of such a device no gas is burned while the operator is setting up the work and



Rego "Economizer" Automatic Shut-off for Welding Gases

no gas is wasted while readjusting the flame. As soon as the welding torch is lifted from the torch arm, a neutral flame is obtained.

Both shut-off valves in the Economizer are of the diaphragm type. The arm body in the diaphragm bonnet is of forged brass. Another feature is the lava tip which draws sufficient air into the acetylene before ignition to produce complete combustion. A simple wall bracket may be supplied for holding the Economizer and the various tips.

Haskins Type HL-5 Toolpost Grinder

Such work as internal grinding of all kinds, grinding lathe centers and rolls, face grinding, and grinding on a planer or shaper is possible on the flexible-shaft toolpost grinder, No. HL-5, announced by the R. G. Haskins Company, 4636 West Fulton St., Chicago, Ill. A large range of attachments suitable for this machine is

Haskins No. HL-5 Flexible-Shaft Toolpost Grinder

available, among which the principal ones are the external grinding spindle and the combination lathe grinding spindle for internal and external work. Other attachments are wire scratch brushes, sanding drums, polishing wheels, and grinding wheels of suitable sizes.

The toolpost grinder is powered by a flexible shaft, and the ¼-hp., heavy-duty motor can be placed 3 or 4 ft. in front or behind the lathe, so that it is entirely out of the operator's way. The tool is designed so as not to obstruct the operator's vision of the work. It is mounted on a pedestal of the proper height for ordinary lathes.

Specifications are as follows: $\frac{7}{16}$-in. x 5-ft. flexible shaft; motor speed, 1,750 r.p.m.; motor swivels full 360 deg.; 1-in. special, endless, high-speed belt; spindle rest on countershaft; three-leg, extra-heavy pedestal with ball-bearing casters, and shipping weight, 145 lb. The unit is furnished with an external lathe attachment, two wrenches, and two 5-in. and two 6-in. grinding wheels.

TRADE PUBLICATIONS

DRILLS, GRINDERS AND BUFFERS, ELECTRIC. The Standard Electrical Tool Co., Cincinnati, Ohio, has published a folder showing its high-power, portable electric drills, grinders, and buffers, which are ball-bearing equipped.

FLEXIBLE COUPLINGS. The Morse Chain Co., Ithaca, N. Y., has published bulletin No. 37 on its flexible couplings, giving complete data on selection, ratings, dimensions, and prices. Photographs of typical installations are included. The bulletin contains 43, 11 x 8½-in. pages.

PIPE AND FITTINGS TONGS. J. H. Williams & Co., Buffalo, N. Y., have published a folder on their "Vulcan Superior" pipe and fittings tongs.

SCREW DRIVER AND NUT SETTER. The Charles L. Jarvis Co., Gildersleeve, Conn., has published a folder showing its screw driver and nut setter, which may be applied to a drilling machine or may be driven by means of a flexible shaft unit. A complete description of the device is given, together with a phantom view.

STAMPINGS. The Marquette Tool & Manufacturing Co., 1904 North Kilbourne Ave., Chicago, Ill., has prepared a booklet entitled "Better Stampings," which gives a survey of 50 stamping and pressed metal plants. Specific stamping and drawing jobs are described in detail. Photographs are given of the parts made and equipment used. A chapter is devoted to dies.

STARTER, MOTOR. The Condit Electrical Manufacturing Corporation, Boston, Mass., has published bulletin No. 482-2 superseding No. 483 on the Type A-30 air motor starter.

TAPPING MACHINES. The Western Machine Tool Works, Holland, Mich., has published Circular No. 8000 on its Garvin No. 3-B heavy-duty automatic tapper of which the constructional features are thoroughly described and illustrated. The circular contains eight 11 x 8½-in. pages.

TAPS, CHASERS, AND GAGES. John Bath & Co., Inc., 18 Grafton St., Worcester, Mass., has issued Catalog No. 12, the third edition of the "Ground Thread Handbook," which gives revised ground hand tap tolerances, and shows a complete line of plug and ring thread gages, high-production thread rolling dies, an adjustable plug gage, and also gives information on thread gage dimensions of the American gage design, and shows a diagram of correct tap terms. Reference tables occupy many of the 176, 9 x 6-in. pages.

TEXROPE DRIVES. The Allis-Chalmers Manufacturing Co., Texrope Division, Milwaukee, Wis., has published a booklet giving photographs and short descriptions of Texrope drives as applied in various industries. These industries are indexed for ready reference. The booklet contains 27, 11 x 8½-in. pages.

TUBE BENDERS. The Parker Appliance Co., 10320 Berea Rd., Cleveland, Ohio, has published bulletin No. 21 on tube bending devices. These include a production type, a smaller hand-operated type, and a servicing device. The bulletin gives complete descriptions of the constructional features.

WELDERS, ARC. The General Electric Co., Schenectady, N. Y., has published three pamphlets on arc welders as follows: No. 874E, superseding 874D, on the Type WD-200A arc welder; No. 875E, superseding 875D, on the Type WD-300A arc welder, and No. 876D, superseding 876C, on the Type WD-400A arc welder. All are printed on 11 x 8½-in. pages.

INDUSTRIAL RELATIONS IN THE METAL TRADES. A booklet having this title has been prepared under the auspices of the Committee on Industrial Relations of the National Metal Trades Association, Peoples Gas Building, Chicago, Ill. It is a statistical summary of data pertaining to labor management in 902 shops. The report consists of 16, 9 x 6-in. pages.

LOCOMOTIVES, CARS, AND RAILROAD REPAIR SHOPS. The U. S. Department of Commerce, Bureau of the Census, has, from the Census of Manufacturers: 1927, prepared a bulletin on locomotives, steam and electric railroad cars and railroad repair shops. The material is given in the form of tables. The bulletin may be obtained from the U. S. Government Printing Office, Washington, D. C., for five cents.

MACHINERY PRODUCTION STATISTICS. The U. S. Department of Commerce, Bureau of the Census, has under the Census of Manufacturers for 1927, published a booklet entitled "Machinery—Machine Tools, Metal Working Machinery, and Foundry and Machine Shop Products." The information disclosed on each of these three major sections includes the number of establishments, the number of wage earners, the amount of wages, cost of materials, value of products, the value added by manufacture, the horsepower required, and the classification of the various types of products. The pamphlet is obtainable from the U. S. Government Printing Office, Washington, D. C., for five cents.

POLISHING MACHINE, METALLOGRAPHIC. The U. S. Department of Commerce, Bureau of Standards, has published Research Paper No. 117 on an automatic metallographic polishing machine, which is designed particularly for studying methods for polishing specimens, but which should be useful in any metallographic laboratory. The bulletin may be obtained from the Superintendent of Documents, Washington, D. C., for 10 cents.

NEWS
OF THE WEEK

Business Leaders Meet to Survey Progress in Readjustment

A SURVEY of the progress made in overcoming the effects of the recent collapse of security values and maintaining at normal flow the currents of business activity will be made by the Executive Committee of the National Business Survey Conference, which is meeting at the Chamber of Commerce of the United States, Thursday, Jan. 23.

Notices of the meeting were issued recently by the chairman of the conference, who said:

"The Executive Committee of the National Business Survey Conference will meet primarily to appraise the progress that has been made in marshaling the mercantile and industrial forces of the country for the stabilization of business and to determine what further steps may be feasible in the prosecution of its purpose. As a basis for its deliberations, it will have before it the information submitted by members of the general committee of the Conference concerning conditions in more than 150 trade and industrial groups, represented by as many associations, constituting a fairly comprehensive cross section of business. In addition, it will have information from local commercial organizations constituting, in effect, a geographical or regional view of business activity.

"Concerted efforts to carry into execution the general purpose of the conference by trade groups and local organizations have already been appreciably effective, particularly in allaying groundless apprehension and sustaining confidence, and this is reflected in a noticeable improvement in business activity. The Executive Committee will consider what further steps may be taken and what direction this concerted effort should take to achieve most effectively the aims of the Conference."

* * * *

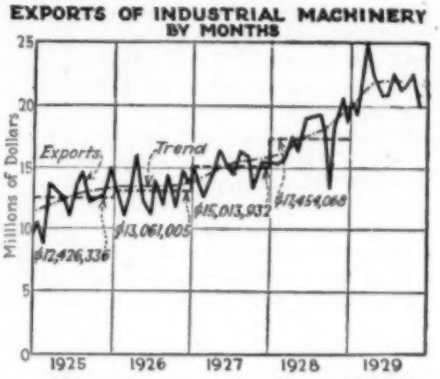
Eleven Months' Machinery Exports Exceed Entire Year of 1928

EXPORTS of American industrial machinery took a rather sharp downward turn during November, 1929, falling by some $2,633,000 dollars, or 12 per cent, under October, 1929, also being less than those made during November, 1928, according to J. C. Cochrane, of the Industrial Machinery Division, U. S. Dept. of Commerce. However, while of current interest, this can be regarded as merely a trade fluctuation and does not much affect the general upward trend in foreign sales of machinery which has been evident throughout the year. Thus, for the eleven months ending with November, these totaled over $237,500,000, or $31,230,000 and 15 per cent more than for the entire year of 1928, and exceeded the volume reached during the first eleven months of 1928 by $46,700,000, or 24 per cent.

Among the principal classes of industrial machinery, foreign sales of metal-working machinery, mining and quarrying machinery, power pumping equipment, sewing machines for factory use, steam engines, water wheels, and water turbines during November declined somewhat under these for the same month of the previous year, the decrease in the last two machines named being particularly notable. On the other hand, as compared with November, 1928, exports of oil-well and refinery machinery, textile machinery, and shoe machinery, during November, 1929, rose substantially and those of internal combustion engines, and construction and conveying machinery showed gains of 39 per cent and 17.5 per cent.

The accompanying table gives the detail of exports of the principal classes of American industrial machinery during November and the first eleven months of 1929, as compared with the corresponding periods of 1928.

While the total for the first eleven months of 1929 is well above that for



the corresponding period of 1928, foreign sales of American metal-working machinery during November fell by 19 per cent under November, 1928. Among the various lines in which declines occurred were lathes, vertical boring mills, chucking machines, gear-cutting machines, drilling machines, sheet and plate metal-working machines, foundry and molding equipment, and pneumatic portable tools. On the other hand, several items showed gains, including planers and shapers and metal-grinding machines, while exports of thread-cutting and automatic screw machines, milling machines, and forging machinery were double, and those of rolling-mill machinery triple, the volume attained in November, 1928.

Among the smaller machinery lines,

Table I—United States Exports of Industrial Machinery

Class of Machinery	November 1928	November 1929	11 Months Ended November 1928	11 Months Ended November 1929
Power generating, except electric and automotive:				
Steam engines (1)	$770,223	$491,464	$7,065,395	$6,998,971
Internal combustion engines (2)	729,550	1,015,667	8,336,902	10,538,603
Water wheels and water turbines	135,342	26,435	734,021	208,112
	1,635,215	1,533,566	16,136,318	17,745,686
Construction and conveying machinery	1,738,214	2,041,919	21,230,356	24,638,411
Mining, oil-well, and pumping machinery:				
Mining and quarrying	1,315,130	1,255,095	12,548,839	16,494,129
Oil-well and refining	1,474,564	1,519,746	14,371,061	23,001,731
Pumping, power (3)	599,044	552,359	4,780,433	6,537,085
	3,388,738	3,327,200	31,700,333	46,032,945
Metal-working machinery:				
Power driven	3,331,211	2,902,793	24,839,378	30,772,565
Other	757,282	535,609	5,987,726	6,851,775
	4,088,493	3,438,402	30,827,104	37,624,340
Textile, sewing, and shoe machinery:				
Textile machinery	1,104,042	1,240,859	11,790,306	12,265,237
Sewing machines (industrial)	342,040	309,224	3,955,315	4,480,853
Shoe machinery	141,011	188,224	1,618,531	1,800,667
	1,587,093	1,738,307	17,364,152	18,546,757
Other industrial machinery (4)	7,907,379	7,933,633	73,554,708	92,914,161
	20,345,032	20,013,027	190,812,971	237,502,300

(1) Excludes locomotives.
(2) Excludes engines not over 10 horsepower.
(3) Excludes windmill pumps; also parts of pumps.
(4) Includes mine cars.

November sales of tobacco machinery, bakery machinery and parts, paper and pulp mill machinery, saw mill and woodworking machinery, blowers and ventilating machinery, ball and roller bearings and parts, laundry and dry cleaning equipment, and iron and steel body valves were all over November, 1928. Business fell off in the case of flour-mill and grist-mill machinery, sugar-mill machinery, brewers machinery, ice-making equipment, refrigerating equipment, and oil-mill machinery. During the first eleven months of 1929, as compared with the same period of 1928, marked gains were made in foreign sales of tobacco machinery, flour mill and grist mill machinery, paper and pulp mill machinery, sawmill and woodworking machinery, blowers and ventilating machinery, refrigerating equipment, oil-mill machinery, ball and roller bearings and parts, air compressors, paint-spraying equipment, laundry and dry cleaning equipment, and iron and steel body valves. As opposed to these favorable developments, however, there was a slump in sales of such items as bakery machinery, sugar-mill machinery, ice-making equipment, brewers' machinery, cotton gins, cotton presses and parts, and grinding and slicing machinery.

* * *

Standards Bureau Installs High-Capacity Tester

A high-capacity testing machine has been installed at the U. S. Bureau of Standards, Washington, D. C., to calibrate the proving ring designed by the Bureau. In the machine, large cast-iron weights, 84 in. in diameter by 7.5 in. thick, are suspended from the proving ring, one at a time. These weights have been adjusted to 10,000 lb., within one-tenth of a pound. Any number of weights up to ten can be used in testing.

* * *

J. A. Fay & Egan Co. Holds Sales Convention

W. T. Haggard, general sales manager of the J. A. Fay & Egan Co., Cincinnati, took charge of the arrangements for the recent annual sales convention of the company. Mr. Haggard also presided at the formal dinner which opened the meeting on Tuesday evening, Dec. 17. Sales representatives from all sections of the country were called in to participate in the three-day meeting which was held to instruct the sales force in the design and construction of the new machines which the company is putting on the market. The company will celebrate its 100th anniversary during the present year.

* * *

PIPE nipple manufactures will hold a trade practice conference on Tuesday, Jan. 28, at the William Penn hotel, Pittsburgh. Commissioner Charles H. March will preside.

Foundry Equipment Orders Double in December

Foundry equipment orders, as indicated by the monthly index of the Foundry Equipment Manufacturers Association, doubled in December. The index of gross orders for November of this year was 128.6, and for December 208. Cancellations for the month were exceedingly low, being only 0.4 per cent. The whole index is considerably higher than that of last year, the index for December, 1928, being 166.5. Shipments for the month also increased by approximately one-fourth, the index being 201.9 for December and 152.2 for the preceding month. The unfilled orders index increased to 473.2 from 445.4, as compared with 333.8 for December of last year. This report is compiled from the monthly reports of the 20 largest manufacturers of foundry equipment. Average shipments for 1922-23-24 are taken as 100 for the index.

* * *

Direct Sales Plan Used by Niles Tool

Direct sales offices were established in Chicago, Detroit, New York, and Pittsburgh on Jan. 1 by the Niles Tool Works Co., Hamilton, Ohio, a division of the General Machinery Corporation. The Chicago office, at 1853 Daily News Bldg., is in charge of A. C. Wais as western manager. F. T. McDonough and W. R. Mullinix will be associated with him. This office will also direct the St. Louis territory, represented by B. A. Donahue, 1857 Railway Exchange Bldg., St. Louis.

The Detroit territory is in charge of G. R. Shields, 227 Curtis Bldg., P. C. McBeth is Pittsburgh manager, with offices at 1723 Grant Bldg., and L. McConnell assisting him. The Pittsburgh office will direct sales in the Cleveland territory, served by C. A. Tankred, 418 Schoffield Bldg. The New York territory will be in charge of D. S. Woods as eastern manager. Associated with him will be S. M. Matcheet and J. A. Ross. Mr. Ross will continue to handle the Philadelphia territory, with offices at 917 Widener Bldg. The Cincinnati territory will be handled from the general sales offices at Hamilton. A. T. Kuehner will supervise general railroad sales from Hamilton also.

Sales agents have been appointed as follows: C. F. Bulloti Machinery Co., 829-831 Folsom St., San Francisco, Calif. (San Francisco territory); Hallidie Machinery Co., 2242 First Ave., South Seattle, Wash. (Seattle-Washington territory); D. S. Mair Machinery Corporation, 505 Esperson Bldg., Houston, Tex. (Texas and Louisiana territory); and Pratt & Whitney Co., L. A. Quinn, Birmingham, Ala. (Southeastern territory). The Mair corporation has an office at 4521 Edmonson Ave., Dallas, Texas, also.

* * *

Officials Lay Plans for Western Metal Congress

Plans for the second Western Metal Congress and Western States Metal & Machinery Exposition, which will be held in the San Francisco Bay region about the middle of Feb., 1931, already are being made. A meeting was held in San Francisco, Jan. 10, which was attended by chairmen and secretaries of the San Francisco units of the following associations: A.S.S.T., A.I.M.E., A.S.M.E., A.I.E.E., A.W.S., S.A.E., and the Pacific Coast Gas Association. The purpose of the meeting was to lay preliminary plans to insure efficient cooperative effort between the different organizations interested.

W. H. Eisenman, secretary of the A.S.S.T., which is sponsoring the entire activity, was present at the meeting and outlined plans.

H. S. Taylor, of the mechanical engineering department, Stanford University, Palo Alto, Calif., has been named program chairman.

* * *

DESPITE a heavy decline during the last five months of the year, the output of 257,800 automobiles in Canada in the eleven months ended November 30, 1929, was a gain of 11 per cent over the 232,957 cars produced during the corresponding period of 1928.

A group of machine-shop and foundry apprentices

The class of 31 boys now taking apprentice training at the plant of the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. Mechanical drawing, foundry practice, machine-shop practice, and athletics are included in the course

Machinery Builders Exhibit at Road Show

Nearly five hundred carloads of machinery, aggregating $2,500,000 in value, were exhibited at the twenty-seventh annual convention and exposition of the American Road Builders' Association at the new Atlantic City Auditorium, Atlantic City, N. J., during the week of Jan. 13-17. There were 373 exhibitors, including practically all of the builders of road building equipment and related lines. These comprised manufacturers of tractors, steam shovels, graders, crushers, concrete mixers, spreaders, trucks, and trailers.

The actual attendance at the exposition surpassed 20,000. Engineers and officials from nearly every state were registered, and there were official delegates from 29 foreign countries. The annual sessions of the association were conducted simultaneously with the machinery exposition and included the reports of 52 committees in addition to the presentation of papers on various aspects of road-building problems by eminent construction and equipment engineers. A paper on "Construction and Maintenance Equipment" was delivered at the Highway Contractors' Session by W. T. Chevalier, publishing director of *Engineering News-Record*. The joint session on Thursday morning was given over to the discussion of papers relating to standardization of purchasing and depreciation of machinery and equipment for road construction.

Trends in road-machinery design featured at the exposition included: the use of manganese and alloy steels on all wearing surfaces in contact with earth and stone; hydraulic operation of many moving parts such as the wings of scrapers; ball and roller bearings in most places, and bronze bushings on treads and for other large, slow-moving bearings; pressure lubrication throughout. Welding has not as yet been generally adopted, partly because of unsatisfactory results on the high-alloy steels, and partly because users lack confidence in welds in heavy-duty equipment.

* * *

Westinghouse Forms Supply Company

Nineteen wholesale electric supply companies with branches in sixty cities have been reorganized by the Westinghouse Electric & Manufacturing Co., into a single system under the name of the Westinghouse Electric Supply Co. Previous to the reorganization, these companies were owned by the Westinghouse Commercial Investment Co., as subsidiaries, but conducted business under their own names and with their own corporate organization. Under the new plan of organization, each unit will continue to carry on its business as it has in the past and with the same management. The principal offices of the new company are located at 150 Broadway, New York City. Officers are A. W. Robertson, chairman of the board, and Walter Cary, president. Operating executives are: John J. Gibson, vice-president; B. W. Clark, general manager; A. J. Selzer, director of sales and purchases, and W. J. Jockers, general sales manager.

* * *

THE International Aircraft Exposition, only officially sponsored "Class A" show of 1930, will be held at St. Louis from Feb. 15 to 23. The show will be held in the new St. Louis arena, providing a main building of 131,000 sq.ft. of floor space and additional buildings with 176,800 sq.ft. of space.

Two Hundred Awards Made By General Electric

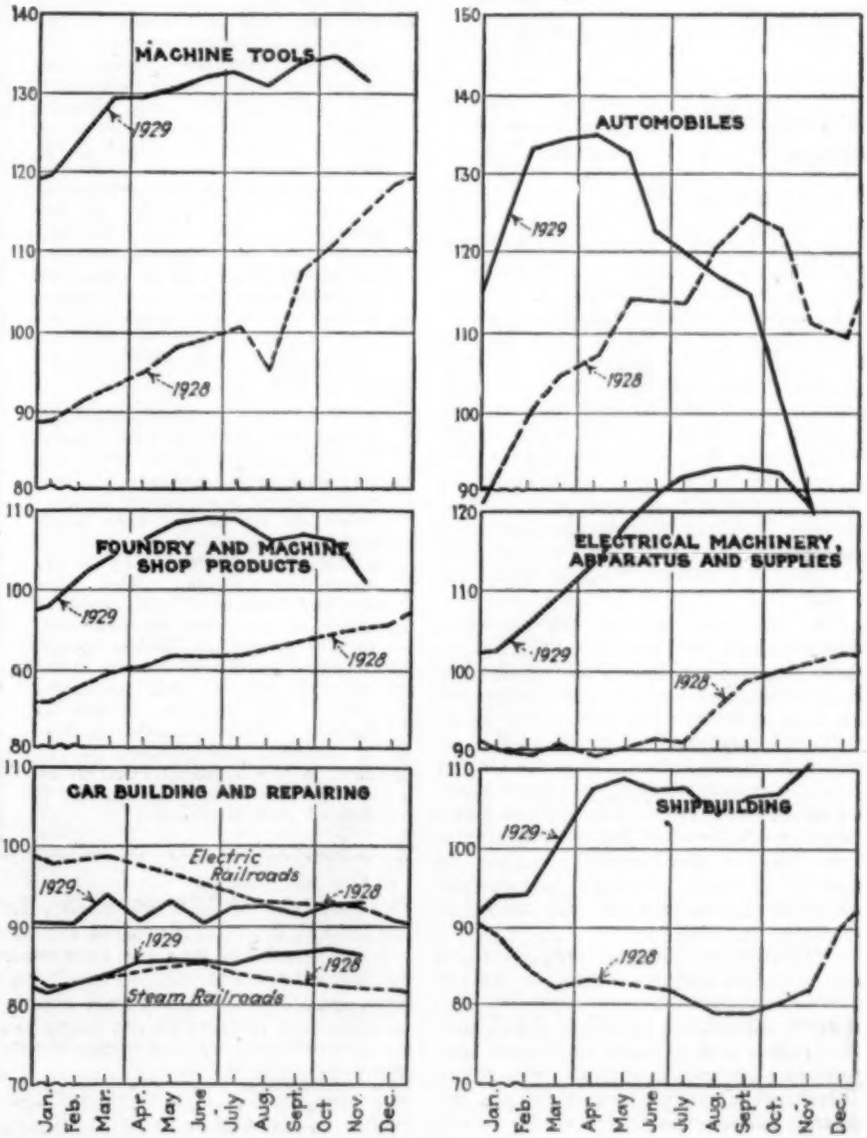
Two hundred awards ranging from $5 to $350 have been made at the Fort Wayne (Ind.) plant of the General Electric Co. to employees for suggestions they offered to improve products, reduce cost, or improve conditions in the plant. The largest award of $350 was made to R. L. Flightner on his suggestion that mill copper, a square-edge material, be used in place of round-edge copper for forming the end rings used on certain fractional-horsepower motors. Mr. Flightner has won a total of 17 awards amounting to $725.

* * * *

Trend of Employment in the Metal-Working Industries

Data Supplied by the Bureau of Labor Statistics

Monthly average for 1926 = 100



BUSINESS · BAROMETER

Outlook seems to be reassuring and encouraging, indicating good times during the coming summer

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

BUSINESS conditions in the United States would be highly satisfactory if quietude and prosperity were synonymous. It is, however, probable that they come nearer to being the same thing than most of us realize, for America has become so accustomed to excitement that it feels the need of some such stimulus when times are dull and the volume of trade is not above normal. But the word normal means healthy, and a normal trade is really a healthy one. Hence, the outlook at the close of last week may be regarded as encouraging, even though it lacked the hectic aspects of a boom or a panic.

Steel and automobile production are expanding; the prospects for building are cheerful. As these are the three most important of the country's basic industries, hard times are inconceivable as long as they remain moderately active, which they seem certain to do even during the first quarter.

In the Orient, the decline in silver continues to cause more or less concern, but this is about the only phase of the situation that can be regarded as at all disturbing. A corner in silver is now threatened, according to romantic dispatches from Bombay, where an aged East Indian banker is said to have contracted for the delivery of more of the white metal than can presently be obtained for settlement. Therefore, it seems probable that from now on the decline in silver will be gradual, and punctuated by reactions which will minimize the distress it might otherwise cause.

On the other side of the Atlantic, much appears to depend upon the Armament Conference that is now gathering in London, but we in America cannot be sure whether this conference is as seriously regarded in Europe as it is on this side of the Atlantic. In the United States so much publicity has been given to the subject that it is difficult to know whether Continental Europe regards a reduction in the world's navies as gravely as do the Anglo-Saxon nations to whom naval strength has meant so much in the past.

The American markets have developed but few new features. Trading on the Stock Exchange is now regarded as subnormal, although a turnover of two million shares a day would have been considered phenomenal ten years ago, when three million shares per diem was regarded as an amazingly high record. The inactivity of the stock market does not bespeak depression or even any loss.

It will probably be some time before the public begins to trade in stocks on a large scale again, but there are signs of an increased interest in the commodity markets. Cotton is one of the articles that reflect this increasing interest. Silk is another, coffee is a third, and more or less speculative activity in sugar is expected just as soon as Congress acts upon the tariff bill.

The Senate has voted to retain the present duty of 1.76 cents per pound on Cuban sugar instead of raising it to 2.20, as the market had expected. It is too early to say what the action of the House and the conference will be, but if the low rate is maintained, it will help the price in the long run.

Rubber is another article around which, because it is close to a record low price, more or less speculative interest seems to be gathering. The grain trade appears to be on the fence, as it waits for development of export demand.

The steel industry is on the mend, and the output of most mills is increasing. There is a distinct gain in new building construction, and there is every reason to believe that the captains of industry will carry out the promises made to President Hoover when they agreed to increase their capital expenditures during the year 1930. But the changes involved take time, and some are explaining that more or less readjustment will be required before they can be given effect. Hence, the word readjustment is being so bandied around that it has acquired a discreditable significance. This is unjust, for life is one long succession of readjustments and our success or failure depends upon our ability to adapt ourselves to them.

Speaking broadly and generally, the outlook seems to be reassuring and encouraging, and it ought to mean good times in the United States during the coming summer.

The question of whether we shall experience the prosperity implied by the foregoing is largely a psychological one. If we insist upon being cheerful ourselves and encourage others to maintain the same attitude, business will certainly improve, for all the integers of improvement are present. Cheap money is among the most important, and one of the reassuring factors in the situation is that it seems certain to continue at least until the autumn of 1930. The liquidation of loans on securities is slow, which means that it is orderly. And our gold exports, which probably will not continue many weeks longer, are having no visible effect upon money rates, for the demands of the member banks upon the Reserve System for accommodation are the smallest in a long time.

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From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

INQUIRIES in volume still seem to be the principal source of optimism to machinery and machine-tool dealers and manufacturers. The business which has been closed this week has been mainly of the character of the past month or two, for single replacement items. Purchasers are scattered as to industry and requirements, no definite trends being indicated. The situation is undoubtedly clearing up, however, and orders are coming in ever increasing volume. Even in downcast Detroit, dealers are beginning to "chirk up." An isolated price has been raised here and there, but prices are expected to stand for some time to come. Deliveries are still improving, and will continue to do so until inquiries turn into signatures on dotted lines.

NEW YORK dealers report inquiries from Westinghouse, General Electric, and a $100,000 one on the way from an oil company. Cincinnati business is unchanged in character, the end of the week bringing some improvement. Detroit employment is picking up in the automobile plants. The New England market is still mainly a series of plans for the year's expansion programs. Buffalo reports increased steel-mill activity. The railroad industry and associated plants are leading buyers in Canada. Railroad inquiries lead in Chicago. Sluggishness is evident in the Southern District, although the small-tool market is flooded with inquiries.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW YORK

Inquiries in the New York machinery and machine-tool market, to use the expression of one of the dealers, "perked up considerably" during the week just closed. Among them are inquiries from General Electric and Westinghouse, and a number from smaller companies planning expansion programs for the first half of the year. A $100,000 list of tools is also being made up by one of the larger oil companies.

Actual orders are scattered, and mainly for single items, although they agregate a larger volume than in the latter part of December and the first week of the present month. One dealer reported January as the best month since last August. Another dealer reported a good amount of municipal business, both from New York City and from surrounding towns. Some orders are being placed for delayed delivery.

Deliveries of course continue to improve. Prices in the main are steady, only one change, more in the nature of an adjustment, being noted during the week. It was a small increase in the price of a production-type automatic lathe. The used-tool market is steady but slow, the abnormal demand for used equipment having evaporated with the return of better deliveries on new tools.

CINCINNATI

There has been very little change in business in the past week. Toward its end, a slight improvement in the market was noted by some dealers. Production continues at about the same level, and there is no delay in making deliveries.

There were no important transactions during the week, the sustaining feature being the demand for single tools and replacements. While a few scattered orders were placed by industrial plants, the great majority came from miscellaneous small users, including general machinists and job-shops. The business was well spotted throughout the country and the purchases were well diversified in sizes and types.

A small increase in the volume of inquiries received is reported by the majority of the manufacturers. The greater portion of these came from miscellaneous users and general machinists. No lists of any importance were received.

Selling agents report that they held their own in the week and express satisfaction with the amount of business done. No unfavorable tendency has been noted in the local market and in adjacent territory; it is thought that demand will continue at its present fair level.

DETROIT

Business has taken a favorable turn within the past few days in the Detroit district. Machinery and machine-tool dealers have a more optimistic outlook than they have had in many weeks. The change has not been reflected in the orders received as much as in the general attitude of manufacturers and in the number and the nature of the inquiries.

Employment has picked up gradually. As the plants begin to get into production a more optimistic attitude is displayed. A large number of inquiries are being received, as compared to the past few months, and the general opinion is that conditions will continue to improve.

No large orders have been received recently. The number of small orders is increasing perceptibly, however, and the indications are that the size and significance of the orders will increase steadily. If production rates continue to advance in the automobile plants it is likely that the manufacturers will feel more favorably disposed to buy the machinery and tools they need.

In Michigan as a whole, conditions are improving at about the same rate as in Detroit and vicinity. Employment is increasing and business is general is in a more wholesome state than it have been since November.

NEW ENGLAND

Metal-working plants in the New England section are pursuing new schedules, in some instances at a lower level of production. Those manufacturers have sufficient old orders for operations extending well into March. Officials are making every effort to hold full manpower, which is indicative of anticipated activity at a rate comparable with that of the month of October.

The situation is decidedly normal, in view of the past high level of activity. Machine-tool officials expect new tool orders following the automobile show. Inquiry bears out these expectations. Orders have not begun to develop from new inquiries to any great extent, and dealers and manufacturers are occupied with old prospects. Automobile interests were more apparent in the business maneuvers of the week, when releases were secured chiefly on orders for automobile parts, held up over the turn of the year.

Electrical manufacturers, radio builders excepted, as well as machine tool builders themselves, plan equipment purchases. These include important companies at Hartford, Bridgeport, Worcester, and Providence. Contract shops begin to show improvement. Machinery prospects are especially good in the paper field.

BUFFALO

The machine-tool trade in the Buffalo district opened up fairly well in the first half of January. Much of the business, of course, was that which had been pending for some time. In one instance, however, a dealer reported that he had closed almost none of the sales projected in the old year, but that he had done a fairly good business on inquiries which had arisen immediately after the New Year.

Inquiries are coming in, although in nothing like the volume of a year ago. Last year, both the aircraft and the automobile industries were purchasing quite a large number of machines, but that is not and will not be the case this spring. Most of the orders thus far have been from comparatively small firms for single pieces of equipment. In any case, January will not compare at all with the same month of one year ago.

Conditions in the electrical equipment end of the business are about the same as in the machine-tool trade, although by closing some big orders in the last week of the year one of the houses made December the second largest month of 1929.

Optimism concerning the future of business is quite general. Some expect the first quarter of the year to be slow, but one good sign to the contrary is to be seen in the fact that practically all of the steel industries in western New York have resumed operations and are operating in some instances nearly at capacity. It is reported that the program of improvements projected last year at Bethlehem Steel is to be continued.

CANADA

While the outlook for business in the machinery and machine-tool field during the coming months is promising, there has been a slight decline in the volume of trade during the last fortnight. The recession is regarded as temporary. Several units of the metal and engineering trades have new contracts on hand which will keep them well employed for five or six months. The car-building industry has passed through a satisfactory period, and as additional business is now being placed with the equipment companies, a continuation of production for several months of 1930 is assured. An order for 20 baggage cars and 15 express refrigerator cars has been awarded to the National Steel Car Corporation by the Canadian National Railways. The contract involved about $600,000.

CHICAGO

Machine-tool market conditions show little variation from those of a week ago. Inquiries have thinned out slightly, but still are being received in sufficient volume to warrant an encouraging outlook for the near future. Just at present, railroad inquiries lead. The Santa Fe, reported a week ago as having come into the market with a substantial list of shop equipment requirements, has since sent out a number of supplemental lists, to be followed by still more. This road, the largest buyer of railroad machine tools last year, is expected to exceed its 1929 purchases by a considerable margin. The Rock Island, the Chicago & Alton, and more recently, the Louisville & Nashville, also are looked to for good orders. While farm machinery and tractor builders have not thus far this year indicated what their equipment needs will cover, it is believed they will be heard from shortly. The same may be said with regard to road-machinery manufacturers. General industrial demand is moderately active, being mainly for units needed to replace worn-out or obsolete equipment. Such business as is being noted at this time comes from widely scattered sources in the Middle West, the aggregate volume of sales being close to the average for the season of the year.

SOUTHERN DISTRICT

Sluggishness is in evidence in the machinery and machine-tool market in this district, although there is spirited inquiry for small tools. The used-tool market has slowed. Considering the light demand, prices have held well. Deliveries are being improved steadily. Municipal and private power plants, anticipating expansion, offer some encouragement for the future, as general conditions are showing a tendency to become normal. Oil-field supply houses and individuals constitute the principal buyers. Railroads, for the most part, are inactive in the market. Factory price advances on small tools were announced by two manufacturers.

Business Items

Stockholders of the Kewanee (Ill.) Manufacturing Co., Kewanee, Ill., held their annual meeting last week, voting to increase the board of directors from three to five members. W. K. Fields and T. R. Stokes were the newly elected members, with R. H. Hayward, R. P. Palmer and J. H. Baethke, re-elected to the board. Directors named officers are as follows: Mr. Hayward, president: Mr. Palmer, vice-president; Mr. Fields secretary, and Mr. Baethke, treasurer.

Hamilton Standard Propeller Co., Burbank, Calif., a unit of the United Aircraft & Transport Co., has moved into its new factory at the United Airport, near Burbank, and will in the future supply Hamilton metal propellers for the Pacific Coast territory, according to official announcement. Thomas F. Hamilton, chairman of the board for the Hamilton company, is personally supervising operations in the new plant.

An addition which will approximately double the capacity of its existing plant is being erected adjacent to the present building of the U. S. Electrical Manufacturing Co., Los Angeles, Calif. The new structure will occupy an area 140x 150 ft., with a wing 24x40 ft. The center bay is designed to accommodate a 5-ton double girder crane with smaller cranes to be installed in the lower side bays.

The Gardner-Denver Co., Denver, Colo., has made the following personnel changes: T. H. Driscoll, Chicago office, has been transferred to the Los Angeles office. Fred V. Moore, eastern states, has been transferred to Phoenix, Ariz. R. J. Featherstone has been assigned to the New York office. Ian Duncan, Edinburgh, Scotland, will represent the line in the London office of Gardner-Denver Co., Limited.

The Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has established a sales office in Chattanooga, Tenn., at 633-634 Tennessee Electric Power Bldg., to serve the eastern and central portions of that state. D. S. Kerr is in charge. This office will operate as a branch of the Atlanta district office.

The United Engineering Society, New York City, has changed its name to Engineering Foundation, Inc., New York. It was set up by the four larger national societies and is a corporation administering real estate, funds, and a library for scientific, educational, and other purposes.

The Agricola Furnace Co., Gadsden, Ala., is adding 18,000 sq.ft. of floor space to the molding room, and is completing an addition to the sheet metal department, increasing the floor space 24,000 sq.ft. Plant capacity will be stepped up approximately 60 per cent.

The Buffalo Forge Co., Buffalo, N. Y., elected the following directors at the annual meeting on Jan. 13: Edgar F. Wendt, Henry W. Wendt, Jr., Chas. A. Booth, Herbert S. Whiting, and Don R. Marsh. They in turn elected the following officers: H. W. Wendt, Jr., chairman of the board; Edgar F. Wendt, president; Chas. A. Booth, vice-president; Edgar F. Wendt, treasurer; and Herbert S. Whiting, secretary.

The work of bringing to completion the new foundry of the Robert Mitchell Co., Ltd., at St. Laurent, near Montreal, has been carried forward with considerable despatch. The new unit is virtually complete and operations have actually commenced.

Prager, Inc., has been formed at New Orleans, La., with a capitalization of $150,000, to assume control of the Novelty Machine Works of that city. Bruno Prager is president; Herman Prager, vice-president, and Julius Prager, secretary-treasurer.

The Reliance Electric & Engineering Co., 1042-1090 Ivanhoe Rd., Cleveland, Ohio, has moved its Pittsburgh office to larger quarters at 2300 Koppers Bldg. B. J. Ballard continues as district sales manager, with C. V. Gregory as assistant.

The Falk Corporation, Milwaukee, Wis., has appointed Root, Neal & Co., Buffalo, N. Y., to sell Falk products in that section. The Youngstown Steel Sales, Inc., Youngstown, Ohio, will represent the Falk company in Ohio.

The Rock Island, Ill., Manufacturing Co., has been acquired by the Birtman Electric Co., Chicago. H. R. Butz, president of the company, announced immediate expansion. H. W. Stickle is general manager.

The McClintoc-Marshall Co., Oliver Bldg., Pittsburgh, Pa., has absorbed the Riter-Conley Co. of that city, and will operate the company as a subsidiary. No management changes will be made.

The plant of the Montpelier Foundry & Machine Co., Montpelier, Ind., has been sold to D. D. Hensel, Muncie attorney. It is supposed the attorney entered the bid for some client, but his identity has not been made public.

Henry Pels & Co., 90 West St., New York City, will occupy booths 944, 945, 1018, and 1019 at the National Heating & Ventilating Engineers Exhibition in Philadelphia, Jan. 27 to 31.

A $10,000 plant will be erected in Twentieth St., Sheffield, Ala., for the W. C. Kelly Axe & Tool Co., West Charleston, W. Va. John Richardson is local manager.

The Jeschke Tool Co., Detroit, has been purchased by H. W. Holmes, who has changed the name to the Micromatic Hone Company.

The Anaconda Wire & Cable Co. of California has removed its San Francisco office and warehouse to 360 Ninth Street.

The Atlas Metal Works, Dallas, Tex., has been incorporated for $50,000.

The Square D Co., Detroit, Mich., adopted the thirteen-period year for accounts, salaries, and internal records.

Personals

ROBERT M. DERBY has been elected vice-president in charge of foreign business of the Niles-Bement-Pond Co., New York. He will be in charge of foreign sales of products of the Niles Tool Works, Pratt & Whitney Co., and the Niles Division of the Shepard-Niles Crane & Hoist Corporation. Mr. Derby returned recently from a 3-month trip of Europe and Soviet Russia. He is a graduate of Massachusetts Institute of Technology in 1901, and has been with the Niles company since that time.

JOHN E. BARKLE, works manager of the South Philadelphia Works of the Westinghouse Electric & Manufacturing Co., when recently promoted, was noted in the "Personals" column with a

photograph of J. H. BELKNAP, manager of the control engineering department of the same company, through an error arising from the similarity in names and employer. This picture is, therefore, definitely Mr. Barkle.

STUART M. CROCKER, who on Jan. 1 resigned his position as vice-president and treasurer of the United Electric Securities Co. to become assistant to the president of the International General Electric Co., has been elected a vice-president, President Clark Minor has announced. Mr. Crocker, a graduate of Harvard University, was assistant to Owen D. Young, chairman of the board of the General Electric Co. and Radio Corporation of America at one time.

FRANK P. COLVILLE, manager of the Dayton and Columbus offices of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, has been named successor to Hamilton D. James, transferred from Cincinnati to Detroit.

HAL W. REYNOLDS has been appointed direct factory representative of the Taft-Pierce Manufacturing Co., Woonsocket, R. I., for the Cleveland territory. His headquarters will be at 1724 St. Clair Ave., Cleveland.

CARL E. GRUNSKY, San Francisco, was elected president of the American Engineering Council at its annual meeting in Washington, D. C. He succeeds ARTHUR W. BERESFORD, New York City. New vice-presidents elected include: L. B. STILLWELL, New York;

MAJ. GARDNER S. WILLIAMS, Ann Arbor, Mich.; O. H. KOCH, Dallas, Tex.; and L. P. ALFORD, New York City.

RICHARD B. CARR, manager, heavy products department, U. S. Steel Products Co., San Francisco, Calif., has resigned and has announced his intention of retiring from business activities. Mr. Carr is well known throughout the Pacific Coast territory, where he has been identified with the steel company for more than 25 years.

GEORGE H. PALM, engineer of the new development division, Yellow Coach & Manufacturing Co., Pontiac, Mich., a division of General Motors, has been appointed engineer in charge of radiator construction and equipment for the Young Radiator Co., Racine, Wisconsin.

GEORGE M. LAUGHLIN, JR., of the Jones & Laughlin Steel Corporation, Pittsburgh, has been elected a director of the American Iron & Steel Institute, New York, to fill a vacancy created by the resignation of T. M. GIRDLER.

HENRY M. SELSON, managing director of the Selson Engineering Co., Ltd., of London, England, is visiting this country on business. At the present time he is inspecting industrial plants and manufacturers in the Middle West.

NORMAN C. NAYLOR has been named vice-president of the American Locomotive Co. and the Railway Steel-Spring Co. J. D. FINN has been appointed secretary to succeed W. S. ROBERTSON, resigned.

HOWARD J. SACHS and FRANK PORDER have been elected members of the board of directors of the Blaw-Knox Co., Pittsburgh, to succeed HERMAN A. BRASSERT, Chicago, and D. L. EYNON resigned.

ARTHUR T. MOREY, formerly general manager of the Commonwealth Steel Co., Granite City, Ill., since 1916, until its merger with the General Steel Castings Corporation, has retired after 25 years' service.

W. SPENCER ROBERTSON has resigned as secretary of the American Locomotive Co. and the Railway Steel Spring Co., New York, to become president of the Permutit Co., New York.

A. M. GYDESEN, works manager of the Derby plant of the Harris-Seybold-Potter Co., Cleveland, Ohio, has resigned his position, according to an announcement by H. P. Bly, general works manager.

GEORGE B. REED has been made a member of the sales engineering department of the Detroit Forging Co., Detroit. He was formerly associated with the Endicott Forging & Mfg. Co., Endicott, New York.

ROGER Q. WILLIAMS, pilot of the *Pathfinder*, which flew from Old Orchard, Me., to Europe, has been elected vice-president of the Commercial Aircraft Co., Bridgeport, Conn.

JOHN B. THOMAS, formerly with the Keystone Steel & Wire Co., Peoria, Ill., has been made general sales manager of the Mid-State Steel & Wire Co., Crawfordsville, Ind., of which he was recently made a director. He succeeds WILLIAM H. CHILDS, now identified with the Continental Steel Co., Kokomo, Indiana.

C. F. TREADWAY, previously secretary and treasurer of the Peck, Stow & Wilcox Co., Southington, Conn., has been elected vice-president. O. J. BLANK, factory manager, was made secretary.

L. E. FRIES has been appointed Cincinnati district manager by the United States Electrical Tool Co., to succeed R. H. CLORE, recently appointed general sales manager.

F. G. GROSSE, in the machinery department of Joseph T. Ryerson & Son, Inc., Chicago, for 17 years, has joined the Stocker, Rumely Wachs Co., Chicago.

W. HOMER HARTZ, formerly vice-president of the Morden Frogg & Crossing Works, Chicago, has been elected president, to succeed the late IRVING T. HARTZ.

ALLEN E. CHESTER has become a member of the sales staff of the Watson-Stillman Co., 75 West St., New York.

L. B. DAVIS has been elected secretary of the Perfect Circle Co., Hagerstown, Ind., to succeed L. S. BOWMAN, who resigned recently.

A. D. HAYES has been placed in charge of the New Orleans office of the Simplex Valve Meter Co., Philadelphia.

Obituaries

WILLIAM L. JACOBY, 57, president of the Kellogg Switchboard & Supply Co., Chicago, died on Jan. 11 in Chicago Heights, Ill. He was a graduate of Lehigh university and had been general manager of the Latrobe Steel Co., Latrobe, Pa., and had helped organize the Inter-Ocean Steel Co., Chicago Heights, Illinois.

DR. JOHN R. BENTON, dean of the college of engineering, University of Florida, died at Gainesville, Fla., on Jan. 9. He was 53 years of age.

Forthcoming Meetings

SOCIETY OF AUTOMOTIVE ENGINEERS —Annual meeting, Jan. 20 to 24, 1930, Book-Cadillac Hotel, Detroit, Mich. National headquarters are at 29 West 39th St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS — Winter Convention, Jan. 27-31, headquarters at Engineering Societies Bldg., 29 W. 39th St., New York City.

STEEL FOUNDERS' SOCIETY OF AMERICA—January meeting, Hotel Sherman, Chicago, Jan. 28. G. P. Rogers, 932 Graybar Bldg., New York City, is managing director.

AMERICAN MANAGEMENT ASSOCIATION—Personnel Administration Conference, Hotel Statler, Cleveland, Ohio, Jan. 29-31. Headquarters of the Association are at 20 Vesey St., New York City.

FIFTH MACHINERY CONFERENCE—U. S. Chamber of Commerce Bldg., H St., Washington, D. C., on Feb. 3 at 9 A.M. Another in the series of conferences of representatives of machinery and equipment associations. Ernest F. DuBrul, 1415 Enquirer Bldg., Cincinnati, Ohio, is chairman.

AMERICAN SOCIETY OF STEEL TREATERS—Semi-annual meeting, Hotel Pennsylvania, New York City, Feb. 7 and 8, 1930. W. H. Eisenman, 7016 Euclid Ave., Cleveland, is secretary.

ENGINEERING INSTITUTE OF CANADA —Annual meeting Feb. 12-14. R. J. Durley, 2050 Mansfield St., Montreal, Que., is secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual meeting, Feb. 17-20, New York City. H. Foster Bain, 29 West 39th St., N. Y., is secretary.

NATIONAL MANAGEMENT CONGRESS —Stevens Hotel, Chicago, March 3 to 5. National Industrial Equipment Exposition in connection, March 3 to 7. G. E. Pfisterer, 308 W. Washington St., Chicago, is manager.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — National Materials Handling meeting, March 5-7, Stevens Hotel, Chicago. Calvin W. Rice, 29 W. 39th St., New York City, is secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Fiftieth Anniversary Celebration, Opens in New York, April 5, afternoon in Hoboken; April 6 in New York; April 7, 8, and 9 in Washington, D. C., at the Mayflower Hotel. Calvin W. Rice, 29 W. 39th St., New York, is secretary.

AMERICAN FOUNDRYMEN'S ASSOCIATION — Annual Convention, Cleveland Public Auditorium, Cleveland, Ohio, May 12-17. C. E. Hoyt, 222 W. Adams St., Chicago, is executive secretary-treasurer.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — Semi-annual meeting, Hotel Book-Cadillac, Detroit, June 2 to 12. Calvin W. Rice, 29 West 39th St., New York City, is secretary.

STEEL INDUSTRY'S EXECUTIVES—Annual Iron & Steel Exposition. Under the sponsorship of the Iron & Steel Electrical Engineers, June 16-20, Broadway Auditorium, Buffalo, N. Y. John F. Kelly, 1010 Empire Bldg., Pittsburgh, Pa., is managing director.

AMERICAN SOCIETY FOR TESTING MATERIALS—Annual meeting, Haddon Hall, Atlantic City, N. J. June 23-27. C. L. Warwick, 1315 Spruce Street, Philadelphia, is secretary-treasurer.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

THE Pittsburgh base on large mill lots of shapes and plates is down 10c. per 100 lb., to $1.80. Soft steel bars, however, are still quoted at $1.90, with reported shading of 10c. per 100 lb. Reinforcing bars dropped 5c. per 100 lb., to $1.95, base, f.o.b. mill. The price weakness displayed by the major materials is rapidly extending to such items as sheets, cold-finished bars, hot and cold-rolled strips. On the other hand, a favorable sign is seen in the increasing demand for railway material, track supplies and automotive steel. In non-ferrous materials there is a decidedly downward movement in prices of tin, zinc, solder and certain forms of scrap.

(All prices as of Jan. 17, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$17.69@$18.19
Northern Basic	19.90
Southern Ohio No. 2	19.90
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	19.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	15.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76@22.26
Virginia No. 2	24.04
Basic	19.75@20.25
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20.26
Basic	20.26
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.35	3.30	3.90†
No. 12	2.15@2.25	3.45	3.35	3.95†
No. 14	2.25@2.35	3.55	3.45	4.00†
No. 16	2.35@2.45	3.65	3.55	4.10†
Black				
Nos. 18 to 20	2.55	3.85	3.70	3.70
No. 22	2.70	4.00	3.85	3.85
No. 24	2.75	4.05	3.90	3.90
No. 26	2.85	4.15	4.00	4.00
No. 28	3.00	4.75	4.15	4.15
Galvanized				
No. 10	2.70@2.80	4.20	4.05	3.80
Nos. 12 to 14	2.80@2.90	4.30	4.15	3.90
No. 16	2.90@3.00	4.40	4.25	4.00
No. 18	3.05@3.15	4.55	4.40	4.15
No. 20	3.20@3.30	4.70	4.60	4.30
No. 22	3.25@3.35	4.75	4.65	4.35
No. 24	3.40@3.50	4.90	4.75	4.50
No. 26	3.65@3.75	5.15	5.00	4.75
No. 28	3.90@4.00	5.40	5.25	5.00

*Light plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt	53.74%	41.2%	55.5%	43.5%	55.5%	42.5%
3½ to 6 in. lap	50.32%	37.78%	53.5%	40.5%	51.6%	39.0%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

Thickness—Decimal	Thickness—B.w.g. and Fractions	Outside Diameter in Inches ¼	⅜	½	¾	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.50	3.65	3.60
Cold drawn, flat or square‡	4.00	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.25	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse— $\frac{3}{32}$, 8.35c. per lb.; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{2}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			19.25
Tin, Straits, pigs, New York			41.00@42.00
Lead, pigs, E. St. Louis	6.10	New York	7.00@7.50
Zinc, slabs, E. St. Louis	5.15	New York	6.75@7.25

	New York	Cleveland	Chicago
Antimony, slabs	10.50@11.00	11.60	14.50
Copper sheets, base	27.75	27.75	27.75
Copper wire, base	20.12½	20.12½	20.12½
Copper, drawn, round, base	26.25	26.25	26.25
Copper tubing, base	29.25	29.25	29.25
Brass sheets, high, base	23.25	23.25	23.25
Brass tubing, high, base	28.25	28.25	28.25
Brass rods, high, base	21.25	21.25	21.25
Brass wire, high, base	23.75	23.75	23.75

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	11.50@12.00	12.25	10.11
Solder (½ and ½).....	29.75	29.75	28@30
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			57.00
Commercial genuine, intermediate grade.....			42.00
Anti-friction metal, general service.....			31.00
No. 4 babbitt, f.o.b.....			11.50

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	53.00	40.00
Tubing.....	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	14.50 @15.00	13.50	13.00 @13.50
Copper, heavy, and wire..	13.50 @13.75	13.00	12.25 @12.75
Copper, light, and bottoms	12.00 @12.25	12.00	11.25 @11.75
Heavy lead.....	4.50 @ 5.00	5.25	4.25 @ 4.75
Tea lead.....	2.87½ @ 3.12½	3.25	3.25 @ 3.75
Brass, heavy, yellow.....	7.75 @ 8.00	8.00	7.25 @ 7.75
Brass, heavy, red.....	11.00 @11.50	12.50	10.25 @10.75
Brass, light.....	6.25 @ 6.75	7.00	6.25 @ 6.75
No. 1 rod-brass turnings.	9.00 @ 9.25	8.00	7.75 @ 8.25
Zinc.....	2.50 @ 2.75	3.00	2.00 @ 2.50

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb..	$0.13*	$0.16	$0.15
Cotton waste, colored, per lb..	.09½*	.12	.12
Wiping cloths, washed, white, per lb.....	.12½	38.00 per M	.16
Sal soda, per lb.....	.02½	.02	.02
Roll sulphur, per lb.....	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.159	.164	.159
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal..	.33	.36	.24
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt..	30%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*Grade F.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.0325	$0.0325
Cold drawn shafting...	per lb..	.035	.035	.034
Brass rods.....	per lb..	.2125	.2125	.19
Solder (½ and ½).....	per lb..	.2975	.295	.35
Cotton waste, white...	per lb..	.13	.13	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	4.59	4.59	3.59
Lard cutting oil.....	per gal.	.65	.65	.65
Machine oil.....	per gal.	.33	.33	.30
Belting, leather, medium.....	off list..	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs...	off list..	50-10%*	50–10%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton.....	Connellsville, 2.60@2.65		
Coke, prompt foundry, per net ton.....	Connellsville, 3.50@4.85		
White lead, dry.....	100 lb. kegs ...	New York, 13.75	
White lead, in oil.....	100 lb. kegs....	New York, 14.25	
Red lead, dry.....	100 lb. kegs....	New York, 13.75	
Red lead, in oil.....	100 lb. kegs....	New York, 15.25	

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, $\frac{7}{16}$-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$7.10
Cast iron welding flux, per lb., net.....	.40
Brazing flux, per lb., net.....	.80

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Mass., Boston—Albany Milling Co., 11 Bristol St.—self-feed rip saw, d.c. motor driven or belt drive.

Mass., Brookline — W. W. Thompson, 16 Roberts St.—Stark lathe No. 4 with milling attachment and spring chucks.

Mass., West Somerville (Boston P. O.) — J. W. P., 141 Elm St.—25 in. engine lathe and chuck and 24 in. drill press.

O., Cleveland—The Austin Co., 16112 Euclid Ave.—is receiving bids foundry equipment, cranes, air compressors, industrial machines, etc., for year of 1930.

O., Columbus — Bd. of Purchase, C. E. Cain, Secy.—24 in. lathe, automatic machine, air compressor, milling machine and other tools for municipal airport.

Opportunities for Future Business

Ark., Little Rock — Arkansas Foundry Co., ft. East 6th St., plans construction improvements to foundry plant to include the erection of a steel building for the manufacture of bow string trusses, used in garages and commercial buildings. Estimated cost $75,000.

Calif., Los Angeles — Wheeler-Osgood Co., 1600 East Washington St., is having plans prepared for a 2 story, 100 x 270 ft. factory on East 15th St. J. M. Cooper, Rives-Strong Bldg., Archt.

Calif., Oakland—Firestone Tire & Rubber Co., c/o C. McCall, 1404 Franklin St., Archt., is receiving bids for the construction of a 1 story service and accessory building at 13th St. and Broadway. Estimated cost $100,000.

Calif., San Francisco — U. S. Government, Supt. of Lighthouses, Customhouse, will soon award contract for a 3 story warehouse and shop at Goat Island.

Conn., Bridgeport—General Electric Co., 1285 Boston Ave., awarded contract for a 4 story, 80 x 200 ft. cable plant. Estimated cost $200,000.

Idaho, Wallace—Yellowstone Trail Garage Co., C. W. Pauling, Secy., is having preliminary plans prepared for the construction of a 2 story garage and repair shop. Estimated cost $60,000.

Ind., Evansville—Servel Inc., 51 East 42nd St., New York, N. Y., plans addition to plant for the manufacture of gas refrigerators. Estimated cost to exceed $40,000. Maturity late 1930.

Ind., Fort Wayne—Capehart Phonograph Co., awarded contract for a 160 x 160 ft. factory. Estimated cost $100,000.

Ind., Fort Wayne—Getz Motor Co., is having plans prepared for the construction of a 3 story machine shop and garage at Main and Fulton Sts. Estimated cost $42,000. C. Weatherhogg, 250 West Wayne St., Archt.

Ind., Indianapolis—American Can Co., 1610 Merchant Bank Bldg., awarded contract for a 5 story plant at 1936 South East St. Estimated cost $41,000.

Ind., Marion—Craftsman Tool Co., awarded contract for the construction of a 40 x 100 ft. factory at 11th and Miller Sts. Estimated cost $43,000. Noted Jan. 2.

Ind., Plymouth—Lee Body & Trailer Co., is having plans prepared for the construction of a plant. Estimated cost $46,000. Private plans.

Ky., Louisville — W. P. Brown & Sons Lumber Co., 2531 South 4th St., will build a creosoting and wood preserving plant in Highland Park. Estimated cost $750,000. G. B. Shipley Co., Century Bldg., Pittsburgh, Pa., Archt. and Engr. Work under the supervision of owners construction forces.

La., Shreveport — Beaird Corp., c/o J. B. Beaird, is having preliminary plans prepared for the construction of a welding plant. Estimataed cost $250,000.

Md., Baltimore—Consolidated Instrument Co., L. L. Friez, Baltimore and Central Sts., is having revised plans prepared for a 3 story addition to plant. Estimated cost $75,000. E. H. Glidde, Jr., American Bldg., Archt. Noted Dec. 5.

Mass., Lynn—L. C. Wade, 640 Summer St., awarded contract for a 1 story, 70 x 100 ft. machine shop and garage. Estimated cost $25,000.

Mich., Detroit—Dept. of Parks & Boulevards, 735 Randolph St., is having plans prepared for the construction of a 2 story service building, etc., at River Rouge Park. Estimated cost $180,000. Private plans.

Mich., Royal Oak — Humphries Tractor Co., J. F. Relaford, 209 West 5th St., is having plans prepared for the construction of a 1 story, 60 x 200 ft. tractor plant at Grand Trunk Ry. Estimated cost $50,000.

Miss., Laurel—Bildoe Corp., H. H. Webber, Pres., plans the construction of a purified iron-oxide mined pigment plant, 100 ton daily capacity.

Mo., Valley Park—Eagle Motor Truck Corp., J. P. Reis, Pres., 6156 Bartmer Ave., St. Louis, awarded contract for the construction of an automobile truck factory including 52 x 200 ft. building for parts department and 50 x 75 ft. paint shop.

N. J., Asbury Park—R. J. Letcher & Son, 4th Ave., awarded contract for a 1 story, 75 x 150 ft. work shop on 4th Ave. Estimated cost $40,000. Noted Oct. 31.

N. J., Belleville—Wallace & Tiernan Co., Inc., 11 Milk St., is having sketches made for addition to factory for the manufacture of chlorine control apparatus. Estimated cost $40,000. Fletcher Thompson Inc., 542 Fairfield Ave., Bridgeport, Conn., Archt. Noted Nov. 28.

N. J., Camden—Aircraft Engine Co., c/o Bennett McLaughlin Co., 3434 Sansom St., Philadelphia, Contrs., will build a 1 story, 75 x 140 ft. factory at Central Airport.

N. J., Carteret — Metal & Thermit Corp., Middlesex Ave., awarded contract for a 1 story, 20 x 80 ft. factory on Middlesex Ave. Estimated cost $40,000.

N. J., Harrison—Driver-Harris Co., Middlesex St., will receive bids about Feb. 1 for the construction of a 1 and 2 story addition to factory for the manufacture of alloys for electrical resistance and castings for annealing, carbonizing, hardening and tempering. Estimated cost $250,000. J. A. Finegan, 776 Broad St., Newark, Archt.

N. J., High Bridge — W. Prym of America Inc., 16 West 19th St., New York, N. Y., is having sketches made for the construction of a 2 story plant for the manufacture of pins, clips, etc., here. Estimated cost $100,000. Architect not selected. Maturity Apr. 1. Noted Dec. 5.

N. J., Newark—Bd. of Education, City Hall, awarded contract for the construction of a high school including manual training room, etc. at Ivy St. and Ellery Ave. $405,474.

N. J., Newark—Joseph Weisberger, 73 Badger Ave., is having plans prepared for a 1 story, 135 x 185 ft. machine shop at 183-197 Magra St. Estimated cost $40,000. Private plans.

N. J., North Hackensack—C. V. R. Bogert, 210 Main St., Hackensack, Archt., will receive bids about Feb. 15 for a 1 story workshop and warehouse at Hackensack Ave. nad Temple St. here, for Hackensack Water Co., Main St., Hackensack. Estimated cost $40,000. Noted Oct. 31.

N. J., Passaic—F. P. Friedman, 395 Springfield Ave., Newark, Archt., will receive bids about Feb. 15, for a 1 story, 140 x 150 ft. garage and repair shop for owner, c/o archt. Estimated cost $150,000. Noted Dec. 26.

N. J., Roselle—Hubeny Bros., 617 East First Ave., is having plans prepared for a 1 story addition to machine shop. Estimated cost $40,000. W. L. Finne, 1201 Grand St., Elizabeth, Archt. Noted Jan. 16.

N. Y., Brooklyn—Brooklyn & Queens Transit Corp., 385 Flatbush Ave. Ext., plans the construction of a terminal shed and repair shop at Surf and Stillwell Aves. Estimated cost $40,000. C. W. Burke, Asst. Ch. Engr.

N. Y., Brooklyn—Dept. of Sanitation, New York, plans the construction of a group of garage buildings in Bedford, Greenpoint, Bay Ridge Sections, also at Housemann St. and Porter Ave.; West New Brighton and Tomkinsville, S. I.; Maspeth and South Jamaica, L. I. Estimated total cost $1,440,000.

N. Y., New York — Centaur Realty Corp., G. C. Slemin, Pres., 235 Broadway, awarded contract for a shop and warehouse. Estimated cost to exceed $40,000.

N. Y., New York—Dept. of Sanitation, plans the construction of a garage and shop. Estimated cost $400,000.

N. Y., New York—Ramp Realty Corp., 12 East 41st St., plans the construction of a workshop and garage at Walton Ave. and 149th St. Estimated cost $40,000. Consolidated Telegraph & Electrical Subway Co., 54 Lafayette St., Archt. and Lessee.

N. C., Charlotte—Charlotte Coca-Cola Bottling Co., 211 North Graham St., plans the construction of a 2 story, 110 x 186 ft. plant including garage, machine, paint and carpenter shops, etc. M. R. Marsh, Builders Bldg., Archt.

O., Cleveland—Chandler Products Corp., F. C. Chandler, Jr., Pres., Terminal Tower, manufacturers of automobile accessories, awarded contract for a 1 story, 90 x 200 ft. factory on Chardon Rd. Estimated cost $150,000.

O., Cleveland—Mid West Forge Co., E. Boden, 17301 St. Clair Ave., is receiving bids for the construction of a 1 story, 58 x 125 ft. continuous furnace shop. Estimated cost $50,000. E. G. Hoefler, 4500 Euclid Ave., Archt.

O., Cleveland—W. E. Whelen, 3550 Avalon Ave., awarded contract for a 1 story, 28 x 105 ft. woodworking shop at 3013 East 81st St. Estimated cost $40,000.

O., Fairfield — Constructing Quartermaster, will soon award contract for the construction of an airplane factory.

O., Massillon—Tyson Roller Bearing Co., C. E. Stuart, Pres., Ohio Merchants Trust Bldg., plans the construction of a 1 story factory at Columbia Heights. Estimated cost $100,000. Private plans.

O., Norwood—Cincinnati Tool Co., 1951 Waverly Ave., plans addition to factory at Montgomery and Reading Rds. Estimated cost $100,000.

Pa., Altoona — Dixon Motor Co., Inc., F. Dixon, Mgr., 2507 Beale Ave., is having plans prepared for a 1 and 2 story automobile truck factory at 9th Ave. between 27th and 28th Sts. Estimated cost $75,000.

Pa., Ivy Rock—Alan Wood Mining Co., subsidiary of Alan Wood Iron & Steel Co., plans addition to plant. Estimated cost $500,000.

Pa., Swissvale—Wubco Battery Co., J. L. Rupp, Pres., Braddock Ave., will soon award contract for the construction of a 1 story battery plant at McCague and Irving Sts. Estimated cost $200,000. Electric Auto Lite Co., Champlain and Mulberry Sts., Toledo, O., Engr.

Tenn., Chattanooga—Tennessee Stove Works, Main St. and Belt Ry., plans addition to plant including erection of an enameling plant. Estimated cost $200,000.

Tex., Abilene — Central Texas Iron Works, 2125 Webster Ave., Waco, will build a 1 story, 50 x 2,000 ft. iron works plant here. Estimated cost $125,000. Private plans.

Tex., Big Springs—Texas & Pacific Ry. Co., Dallas, awarded contract for a group of railway terminal buildings, including roundhouse, machine and blacksmith shops, repair building, etc., here. Estimated cost $240,000. E. F. Mitchell, Dallas, Ch. Engr.

Tex., San Antonio—U. S. Government, War Dept., Washington, D. C., plans the construction of a 440 x 560 ft. depot shop at Duncan field near here, $300,000, also 1 and 2 story air corps shops, including paint, dye and repair departments at Randolph field, $210,000.

Wis., West Allis—Municipal Foundries Inc., plans the construction of a 50 x 50 ft. factory at 63 75th Ave.

Wis., West Milwaukee (mail Milwaukee) — Harnischfeger Corp., 38th St. and National Ave. plans addition to factory for the manufacture of excavation machinery, here. Estimated cost $200,000.

Ont., Levack — International Nickel Co. of Canada Ltd., Copper Cliffe, awarded contract for rebuilding mining building destroyed by fire. Estimated cost $250,000.

Ont., Sandwich—Sandwich Foundry Ltd., 400 Bloomfield Rd., awarded contract for a 1 story foundry. Estimated cost $150,000.

Ont., Toronto—Canadian Wheel & Rim Co., 27 Yorkville Ave., plans the construction of a 2 story, 54 x 166 ft. wheel and rim plant. Estimated cost $80,000. Catto & Catto, 1 Wellington St. W., Archts.

C. Z., Coco Solo—Bureau of Yards & Docks, Navy Dept., Washington, D. C., plans the construction of a storehouse and engine overhaul shop at Naval Air Station.